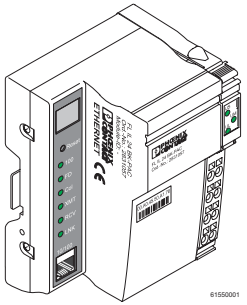
FL IL 24 BK-PAC

Ethernet/Inline Bus Terminal



Data Sheet 615503 07/2003

Product Description

Ethernet/Inline bus terminal

Features

- Ethernet coupler for the Inline I/O system
- Ethernet TCP/IP
  - 10/100 Base-T(X)
  - Management via SNMP
  - Integrated web server
- Up to 63 additional Inline modules can be connected (process data channel) incl. eight PCP modules
- Flexible installation system for Ethernet
- IP parameter setting via BootP, web-based management (WBM) or SNMP
- DDI software interface (Device Driver Interface) or Modbus/TCP
- Driver software for Sun Solaris/Windows NT
- Software interface kit for other Unix systems

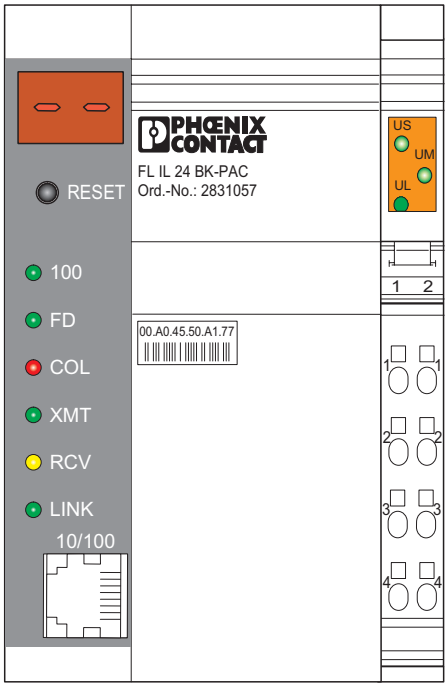


Figure 1 FL IL 24 BK-PAC

Applications

- Connection of sensors/actuators via Ethernet.
- Exchange of Inline process data via Ethernet using a Unix workstation or a Windows NT computer.

Table of Contents

1 General Information

Warning
If these instructions are not followed there is a danger of damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate these devices. According to the safety instructions in this text, qualified personnel are persons who are authorized to start up, to ground and to mark devices, systems, and equipment according to the standards of safety technology. In addition, these persons must be familiar with all warning instructions and maintenance measures in this text.

Warning
The FL IL 24 BK-PAC module is designed exclusively for SELV operation according to IEC 950 EN 60950/VDE 0805.

Shielding
The shielding ground of the connected twisted-pair cables is electrically connected with the female connector. When connecting network segments, avoid ground loops, potential transfers, and voltage equalization currents using the braided shield.

ESD
The modules are fitted with electrostatically sensitive components. Exposure to electric fields or charge imbalance may damage or adversely affect the life of the modules.
The following protective measures must be taken when using electrostatically sensitive modules:

Create an electrical equipotential bonding between yourself and your surroundings, e.g., using an ESD wristband, which is connected to the grounded DIN rail on which the module will be mounted.

Housing
Only authorized Phoenix Contact personnel are permitted to open the housing.

2 Structure of the FL IL 24 BK-PAC Bus Terminal

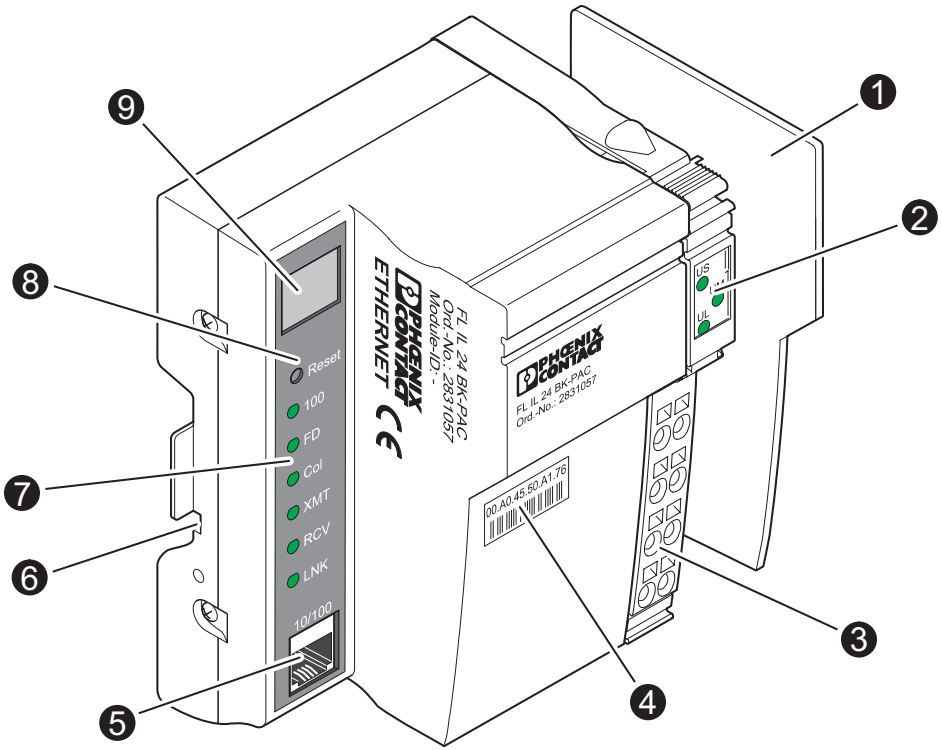


Figure 2 Structure of the FL IL 24 BK-PAC bus terminal

The bus terminal has the following components:

1 End plate to protect the last Inline module

2 Inline diagnostic indicators

3 24 V DC supply and functional earth ground connector
(not supplied as standard - order as accessory)

4 MAC address in clear text and as a barcode

5 Ethernet interface (twisted-pair cables in RJ45 format)

6 Two PE contacts for grounding the bus terminal using a DIN rail (on the back of the module)

7 Ethernet status and diagnostic indicators

8 Reset button

9 7-segment display for the device status (Ethernet communication unit)

3 Local Status and Diagnostic Indicators

Des.	Color	Status	Meaning
Electronics Module			
UL	Green	ON	24 V supply, 7 V communications power/interface supply OK
		OFF	24 V supply, 7 V communications power/interface supply not OK
UM	Green	ON	Voltage is present in the main circuit (+24 V DC)
		OFF	Voltage is not present in the main circuit
US	Green	ON	24 V segment supply is present
		OFF	24 V segment supply is not present
Ethernet Port			
100	Green	ON	Operation at 100 Mbps
		OFF	Operation at 10 Mbps
FD	Green	ON	Data transmission in full duplex mode
		OFF	Data transmission in half duplex mode
COL	Red	ON	Collision of data telegrams
		OFF	Transmission of telegrams without a collision
XMT	Green	ON	Data telegrams are being sent
		OFF	Data telegrams are not being sent
RCV	Yellow	ON	Data telegrams are being received
		OFF	Data telegrams are not being received
LNK	Green	ON	Physical network connection ready-to-operate
		OFF	Physical network connection interrupted or not present

Reset Button

The reset button is on the front plate. When the reset button is pressed the Inline masterboard and the Ethernet adapter are completely reset and initialized (selftest, etc.). Inline system outputs are reset and inputs are not read.

4 Installation and Mounting/Removal

Install the FL IL 24 BK-PAC on a clean DIN rail according to DIN EN 50 022 (Phoenix Contact: item NS 35). To avoid contact resistance only use clean, corrosion-free DIN rails. End clamps must be mounted on both sides of the module to stop the terminals from slipping on the DIN rail.

The functional earth ground must be connected to the 24 V DC supply/functional earth ground connection. The contacts are directly connected with the voltage jumper and FE springs on the bottom of the housing. The terminal is grounded when it is snapped onto a grounded DIN rail. Functional earth ground is only used to discharge interference.

4.1 Mounting:

1. First, snap all required electronics bases vertically onto the DIN rail.

Ensure that **all** featherkeys and keyways on adjacent terminals are interlocked.

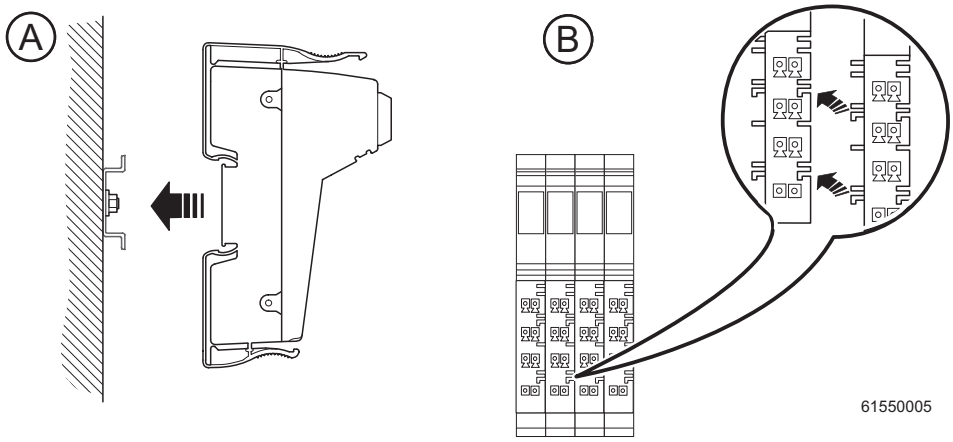


Figure 3 Snapping on the electronics base

2. Next, attach the connectors to the corresponding bases.

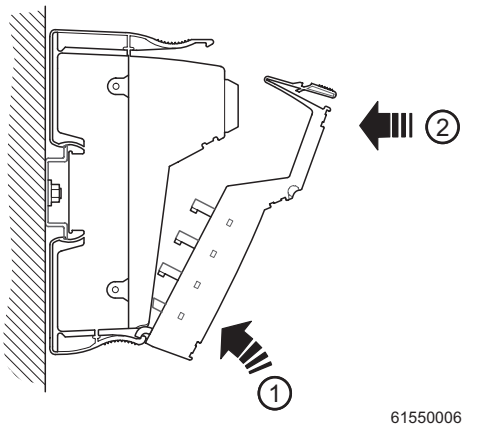


Figure 4 Plugging in the I/O connector

Please refer to the Inline configuration and installation manual "IB IL SYS PRO UM E" (Order No. 27 43 04 8).

5 Connecting the Supply Voltage

The module is operated using a +24 V DC SELV.

Typical Connection of the Supply Voltage

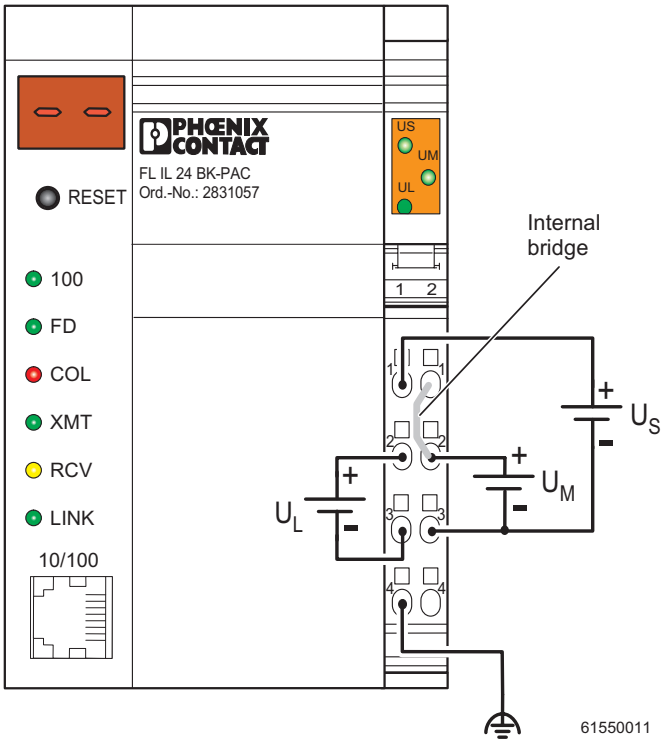


Figure 5 Typical connection of the supply voltage

5.1 Connector Assignment

Terminal Point	Assignment		Wire Color/Remark
Connector	**Power Connector**		
1.1	24 V DC (U_S)	24 V segment supply	The supplied voltage is directly led to the voltage jumper.
1.2	24 V DC (U_L)	24 V supply	The communications power for the bus terminal and the connected local bus devices is generated from this power. The 24 V analog power (U_{ANA}) for the local bus devices is also generated.
2.1, 2.2	24 V DC (U_M)	Main power	The main power is diverted to the local bus devices via the voltage jumpers.
1.3	LGND	Reference potential logic ground	The potential is the reference ground for the communications power.
2.3	SGND	Reference potential segment ground	The reference potential is directly routed to the potential jumper and is, at the same time, ground reference for the main and segment supply.
1.4, 2.4	FE	Functional earth ground (FE)	The functional earth ground must be connected to the 24 V DC supply/functional earth ground connection. The contacts are directly connected with the voltage jumper and FE springs on the bottom of the housing. The terminal is grounded when it is snapped onto a grounded DIN rail. Functional earth ground is only used to discharge interference.

The maximum total current through the voltage jumpers is 8 A.

The functional earth ground must be connected to the 24 V DC supply/functional earth ground connection.

5.2 24 V Segment Supply/24 V Main Supply

Segment supply and main supply must have the same reference potential. A floating architecture is not possible.

5.3 24 V Segment Supply

An emergency stop circuit, for example, can be connected and switched on the connector between terminal points 1.1/2.1. This means that there is no segment supply through terminal point 1.1.
In addition, it is possible to supply the segment supply from the main power. For this, 1.1/2.1 must be jumpered.

The 24 V segment supply is protected against polarity reversal (inverse-parallel diode > causes a short circuit in the event of polarity reversal) and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current is not exceeded.

5.4 24 V Main Power

The 24 V main supply is protected against polarity reversal (inverse-parallel diode > causes a short circuit in the event of polarity reversal) and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current is not exceeded.

5.5 24 V BK Supply

The 24 V BK supply is protected against polarity reversal and surge voltage. The protective elements are only used to protect the power supply unit.

5.6 Jumpers

Terminals 1.3 and 2.3 on the connector can be jumpered if the same reference potential is to be used for the communications power and segment voltage.

6 Supported Inline Modules

Digital Input/Output Modules

Designation	Properties	Order No.
IB IL 24 DI 2	2 inputs, 4-wire connection, 24 V DC	27 26 20 1
IB IL 24 DI 2-NPN	2 inputs with negative logic, 4-wire connection, 24 V DC	27 40 11 2
IB IL 24 EDI 2	2 input, 4-wire connection, with electronic overload protection and diagnostics	27 42 60 9
IB IL 24 EDI 2-DESINA	2 input, 4-wire connection according to Desina specification, with electronic overload protection and diagnostics	27 40 32 6
IB IL 24 DI 4	4 inputs, 3-wire connection, 24 V DC	27 26 21 4
IB IL 24 DI 8	8 inputs, 4-wire connection, 24 V DC	27 26 22 7
IB IL 24 DI 16	16 inputs, 3-wire connection, 24 V DC	27 26 23 0
IB IL 120 DI 1	1 input, 3-wire connection, 120 V AC	28 36 70 6
IB IL 230 DI 1	1 input, 3-wire connection, 230 V AC	27 40 34 2
IB IL 24 DO 2	2 outputs, 500 mA, 4-wire connection, 24 V DC	27 40 10 6
IB IL 24 DO 2-2A	2 outputs, 2 A, 4-wire connection, 24 V DC	27 26 24 3
IB IL 24 DO 2-NPN	2 outputs with negative logic, 500 mA, 4-wire connection, 24 V DC	27 40 11 9
IB IL 24 DO 4	4 inputs, 500 mA, 3-wire connection, 24 V DC	27 26 25 6
IB IL 24 DO 8	8 inputs, 500 mA, 4-wire connection, 24 V DC	27 26 26 9
IB IL 24 DO 16	16 inputs, 500 mA, 3-wire connection, 24 V DC	27 26 27 2
IB IL DO 1 AC	1 output, 12 V - 253 V AC, 500 mA, 3-wire connection	28 36 74 8
IB IL 24/230 DOR 1/W	1 relay changeover contact, 5 V - 253 V AC, 3 A	28 36 43 4

Analog Input/Output Modules

Designation	Properties	Order No.
IB IL AI 2/SF	2 inputs, 2-wire connection, 24 V DC, 0 - 20 mA, 4 - 20 mA, 0 - 10 V, ±10 V	27 26 28 5
IB IL AO 1/SF	1 output, 2-wire connection, 24 V DC, 0 - 20 mA, 4 - 20 mA, 0 - 10 V	27 26 29 8
IB IL AO 1/U/SF	1 output, 2-wire connection, 24 V DC, 0 - 10 V	27 27 77 6
IB IL AO 2/U/BP	2 outputs, 2-wire connection, 24 V DC, 0 - 10 V, ±10 V	27 32 73 2

Special Function Modules

Designation	Properties	Order No.
IB IL TEMP 2 UTH	2 inputs, 2-wire connection, 24 V DC, thermocouples	27 27 76 3
IB IL TEMP 2 RTD	2 inputs, 4-wire connection, 24 V DC, resistance sensors	27 26 30 8
IB IL SSI	1 absolute encoder input, 4 digital inputs, 4 digital outputs, 500 mA, 3-wire connection, 24 V DC	28 36 34 0
IB IL INC	1 incremental encoder input, 4 digital inputs, 4 digital outputs, 500 mA, 3-wire connection, 24 V DC	28 36 32 4
IB IL CNT	1 counter input, 1 control input, 1 digital output, 500 mA, 3-wire connection, 24 V DC	28 36 33 7
IB IL 24 TC	Thermistor terminal	27 27 41 7

Power and Segment Terminals

Designation	Properties	Order No.
IB IL 24 PRW IN	Power terminal, 24 V DC	27 26 31 1
IB IL 24 PRW IN/F	Power terminal, 24 V DC with fuse	27 27 90 9
IB IL 24 PRW IN/F-D	Power terminal, 24 V DC with fuse and diagnostics	28 36 66 7
IB IL 120 PRW IN	Power terminal, 120 V AC with fuse	27 31 70 4
IB IL 230 PRW IN	Power terminal, 230 V AC with fuse	27 40 33 9
IB IL 24 SEG	Segment terminal, 24 V DC	27 26 32 4
IB IL 24 SEG/F	Segment terminal, 24 V DC with fuse	27 27 74 7
IB IL 24 SEG/F-D	Segment terminal, 24 V DC with fuse and diagnostics	28 36 68 3

7 Ethernet Connection

7.1 Ethernet Interface

The FL IL 24 BK-PAC has an Ethernet interface on the front in RJ45 format, to which only a twisted-pair cable with an impedance of 100 Ω can be connected. The data transmission rate is 10/100 Mbps. The 10Base-T port on the bus terminal can detect a pair of incorrectly connected receiving cables (RD+/RD-) and correct them using the Auto Polarity Correction function.

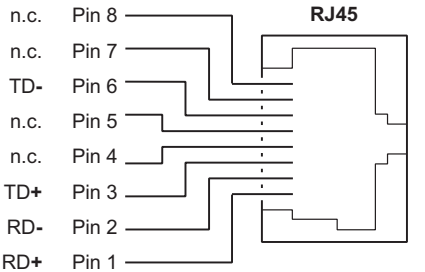


Figure 6 Pin assignment of the Ethernet port in RJ45 format

7.2 Pin Assignment of Crossover/1:1 Cables

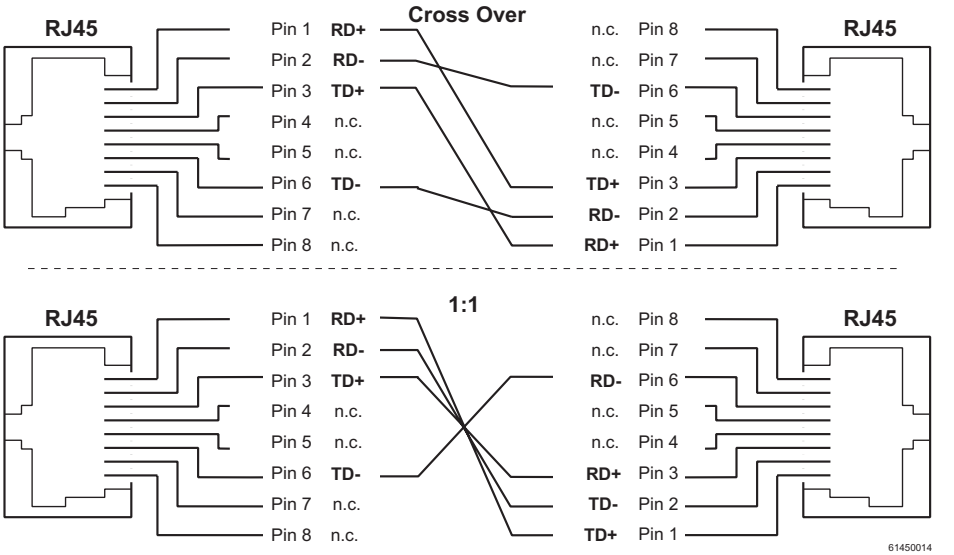


Figure 7 Pin assignment of crossover/1:1 cables

7.3 Connecting Cables Between Ethernet Components

To connect Ethernet components (structure components or terminal devices) with one another, crossover cables (C/O) or 1:1 wired cables (1:1) are required. In general, 1:1 wired cables are required between structure components and terminal devices, whereas crossover cables are used for connections between two structure components and for connections between two terminal devices. To distinguish between the two cable types, **green** bending protection bushings should be used for **crossover** cables, and **gray** bending protection bushings for **1:1** wired cables. The cables required between the corresponding components from Phoenix Contact are specified in the following table (example).

	FL HUB 10BASE-T	FL HUB AGENT	FL SWITCH...	FL IBS SC/I-T	FL IL 24 BK	FL MC 10BASE-T/FO POF	PC/Notebook	RFC 430 ETH-IB	RFC 450 ETH-IB	IBS 24 ETH DSC/I-T	IBS S7 400 ETH DSC/I-T
FL HUB 10BASE-T	C/O	C/O	C/O	1:1	1:1	C/O	1:1	1:1	1:1	1:1	1:1
FL HUB AGENT	C/O	C/O	C/O	1:1	1:1	C/O	1:1	1:1	1:1	1:1	1:1
FL SWITCH...	C/O	C/O	C/O	1:1	1:1	C/O	1:1	1:1	1:1	1:1	1:1
FL IBS SC/I-T	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
FL IL 24 BK	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
FL MC 10BASE-T/FO POF	C/O	C/O	C/O	1:1	1:1	C/O	1:1	1:1	1:1	1:1	1:1
PC/Notebook	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
RFC 430 ETH-IB	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
RFC 450 ETH-IB	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
IBS 24 ETH DSC/I-T	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O
IBS S7 400 ETH DSC/I-T	1:1	1:1	1:1	C/O	C/O	1:1	C/O	C/O	C/O	C/O	C/O

8 Startup

8.1 Starting the Firmware

The firmware is started after the device has been connected to the power supply or the reset key has been pressed. The following sequence is displayed:

Display	Meaning
01	Boot Loader is started BootP request is sent
bo	Firmware is extracted
02	Firmware is started
PP --	Plug & play mode is activated Operation

8.2 Sending BootP Requests

Initial Startup:

During initial startup, the device sends a BootP request without interruption until it receives a valid IP address. The requests are transmitted at varying intervals (2 s, 4 s, 8 s, 2 s, 4 s etc.) so that the network is not loaded unnecessarily.
If valid IP parameters are received, they are saved as configuration data by the device.

Later Startups:
If the device already has valid configuration data, it only sends three more BootP requests on a restart. If it receives a BootP reply, the new parameters are saved. If the device does not receive a reply, it starts with the previous configuration.

If **only** the tftp parameters are modified (see "Firmware Update" on page 26) for the existing configuration and the IP parameters remain the same, e.g., using firmware with a new file name, the modifications to the configuration only take effect when the software update flag is enabled on the device web page or via SNMP.

9 Assigning an IP Address Using the Factory Manager

Alternatively, the IP address can be entered via any BootP server.

There are two options available when assigning the IP address: reading the MAC address via BootP or manually entering the MAC address in the Add New Ethernet Device dialog box in the Factory Manager.

9.1 BootP

– Ensure that the network scanner and the BootP server have been started.
– Connect the device to the network and the supply voltage.
– The BootP request for the new device triggered by the device restart/reset appears in the Factory Manager message window. Select the relevant message.
– Click with the right mouse button on the BootP message for the device or on .
– Enter the relevant data in the Add New Ethernet Device dialog box (see Figure 8).
– Save the configuration settings and restart the device (reset key or power up).

If the device is being started for the first time, it is then automatically booted with the specified configuration. If the device is not being started for the first time, save the configuration and restart the device (reset key or power up). The device now sends another BootP request and receives the specified IP parameters from the BootP server/Factory Manager (see Figure 9, message highlighted in gray).

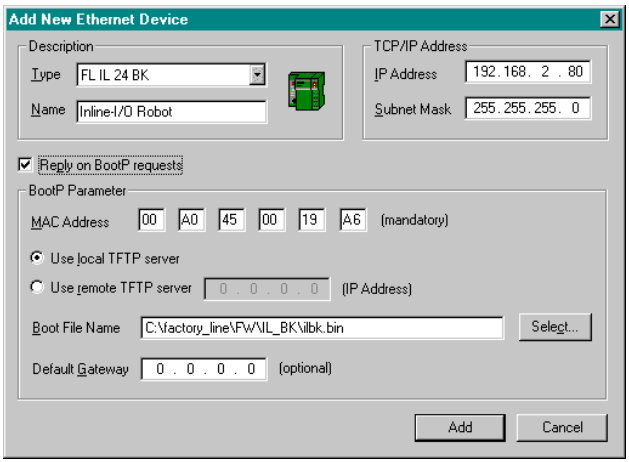


Figure 8 Add New Ethernet Device dialog box in the Factory Manager

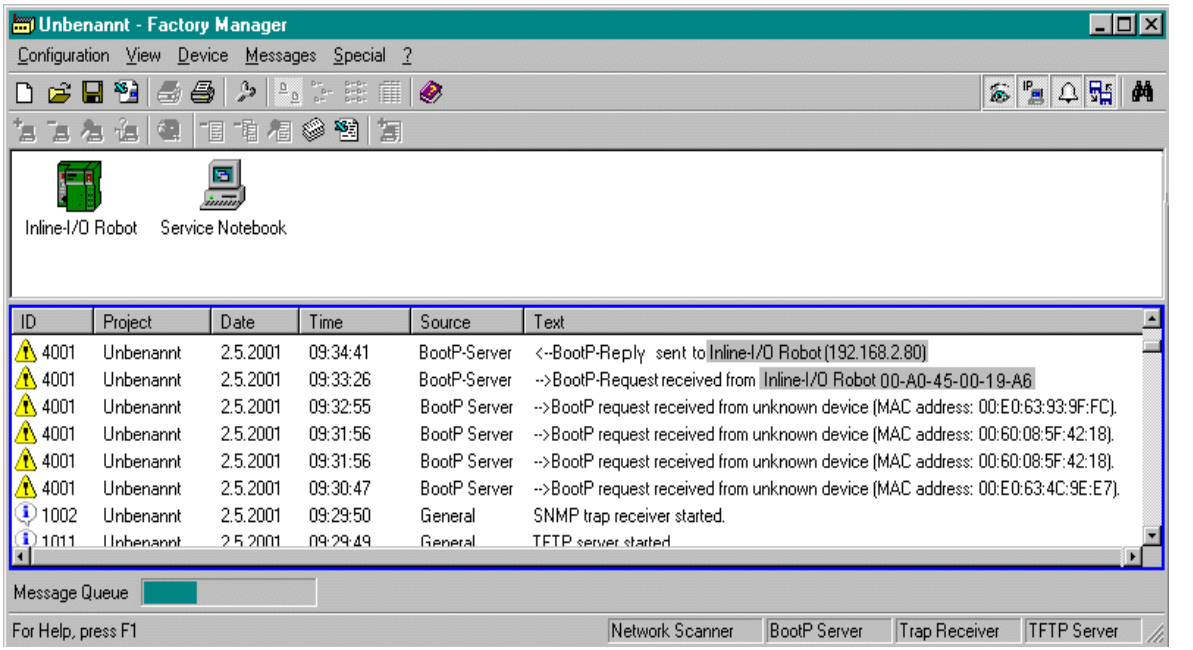


Figure 9 Requesting and receiving the IP parameters (gray)

9.2 Manual Addition of Devices Using The Factory Manager

– Open the Add New Ethernet Device dialog box (see Figure 10) by clicking on , by selecting "Add Device" from the Device View context menu or by using the Ctrl+A key combination.
– Enter the desired data under "Description" and "TCP/IP Address".
– Activate the "BootP Parameter" area by clicking on "Reply on BootP requests".
– Enter the MAC address. It is displayed on the front plate of the bus terminal.
– Save the configuration settings and restart the device (reset key or power up).

The device now sends another BootP request and receives the specified IP parameters from the BootP server (see Figure 9, message highlighted in gray).

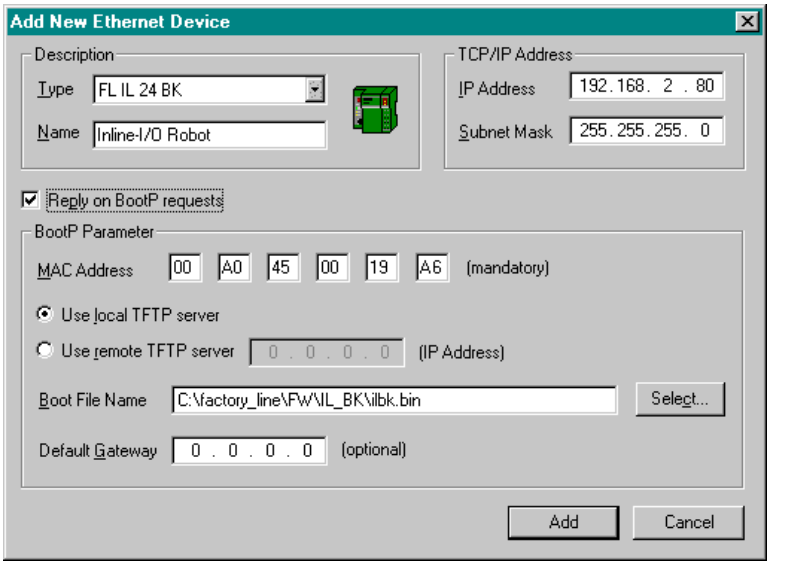


Figure 10 Add New Ethernet Device dialog box in the Factory Manager

10 Selecting IP Addresses

The IP address is a 32-bit address, which consists of a network part and a user part. The network part consists of the network class and the network address.
There are currently five defined network classes; classes A, B, and C are used in modern applications, while classes D and E are hardly ever used. It is therefore usually sufficient if a network device only "recognizes" classes A, B, and C.

The network class is represented by the first bits for the binary representation of the IP address. The key factor is the number of "ones" before the first "zero". The assignment of classes is shown in the following table. The free cells in the table are not relevant to the network class and are used for the network address.

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5
Class A	0				
Class B	1	0			
Class C	1	1	0		
Class D	1	1	1	0	
Class E	1	1	1	1	0

The bits for the network class are followed by those for the network address and the user address. Depending on the network class, a different number of bits are available, both for the network address (network ID) and the user address (host ID).

	Network ID	Host ID
Class A	7 bits	24 bits
Class B	14 bits	16 bits
Class C	21 bits	8 bits
Class D	28-bit multicast identifier	
Class E	27 bits (reserved)	

IP addresses can be represented in decimal, octal or hexadecimal form. In decimal form, bytes are separated by dots (dotted decimal notation) to show the logical grouping of the individual bytes.

The decimal points do not divide the address into a network and user address. Only the value of the first bits (before the first "zero") specifies the network class and the number of remaining bits in the address.

10.1 Possible Address Combinations

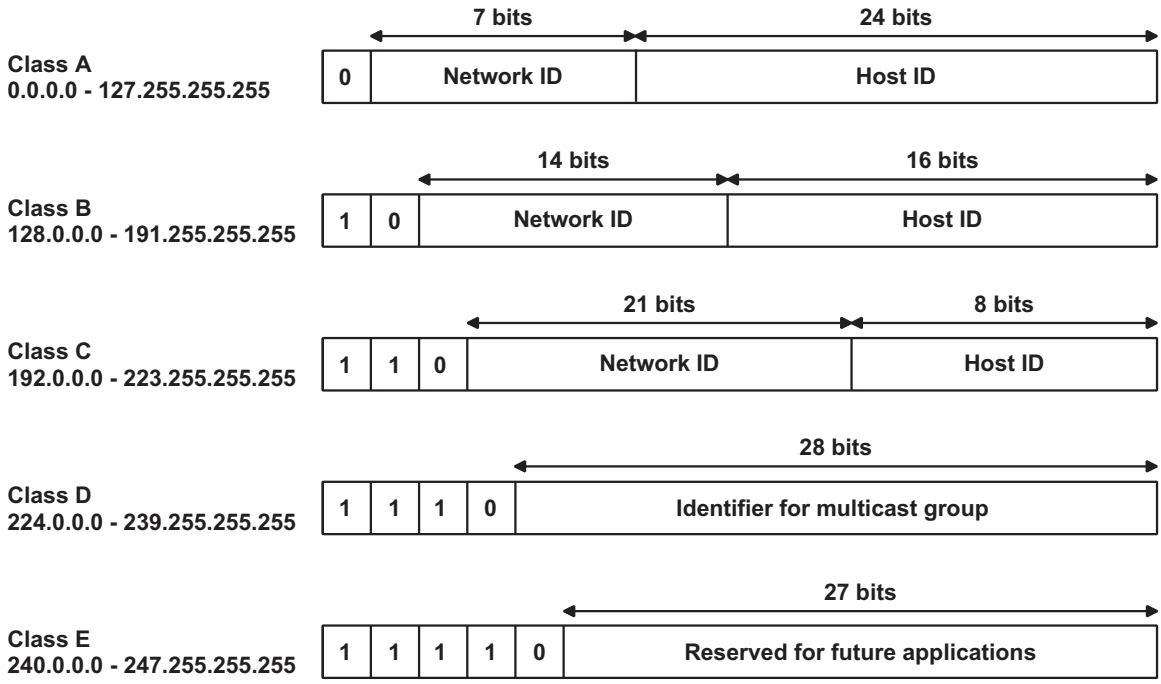


Figure 11 Structure of IP addresses

Special IP Addresses for Special Applications

Certain IP addresses are reserved for special functions. The following addresses should not be used as standard IP addresses.

127.x.x.x Addresses

The class A network address "127" is reserved for a loop-back function on all computers, regardless of the network class. This loop-back function may only be used on networked computers for internal test purposes.

If a telegram is addressed to a computer with the value 127 in the first byte, the receiver immediately sends the telegram back to the sender.

The correct installation and configuration of the TCP/IP software, for example, can be checked in this way.

The first and second layers of the ISO/OSI model are not included in the test and should therefore be tested separately using the ping function.

Value 255 in the Byte

Value 255 is defined as a broadcast address. The telegram is therefore sent to all the computers that are in the same part of the network. Examples include 004.255.255.255, 198.2.7.255 or 255.255.255.255 (all the computers in all the networks). If the network is divided into subnetworks, the subnet masks must be observed during calculation, otherwise some devices may be omitted.

0.x.x.x Addresses

Value 0 is the ID of the specific network. If the IP address starts with a zero, the receiver is in the same network. Example: 0.2.1.1 refers to device 2.1.1 in this network.

The zero previously signified a broadcast address. If older devices are used, an unauthorized broadcast and the complete overload of the entire network (broadcast storm) may be triggered when using the IP address 0.x.x.x.

11 Subnet Masks

Routers and gateways divide large networks into subnetworks. The IP addresses for individual devices are assigned to specific subnetworks by the subnet mask. The **network part** of an IP address is **not** modified by the subnet mask. An extended IP address is generated from the user address and subnet mask. Because the masked subnetwork is only recognized by the local computer, all the other devices identifies this extended IP address as a standard IP address.

11.1 Structure of the Subnet Mask

The subnet mask always contains the same number of bits as an IP address. The subnet mask has the same number of bits (in the same position) set to "one", which is reflected in the IP address for the network class.

Example: An IP address from class A contains a 1-byte network address and a 3-byte PC address. Therefore, the first byte of the subnet mask may only contain "ones".

The remaining bits (three bytes) then contain the address of the subnetwork and the PC. The extended IP address is created when the bits for the IP address and the bits for the subnet mask are ANDed. Because the subnetwork is only recognized by local devices, the corresponding IP address appears as a "normal" IP address to all the other devices.

Application

If the ANDing of the address bits gives the local network address and the local subnetwork address, the device is located in the local network. If the ANDing gives a different result, the data telegram is sent to the subnetwork router.

Example for a class B subnet mask:

Decimal notation:	255.255.192.0
Binary notation:	1111 1111.1111 1111.1100 0000.0000 0000

Using this subnet mask, the TCP/IP protocol software differentiates between the devices that are connected to the local subnetwork and the devices that are located in other subnetworks.

Example: Device 1 wants to establish a connection with device 2 using the above subnet mask. Device 2 has IP address 59.EA.55.32.

IP address display for device 2:

Hexadecimal notation:	59.EA.55.32
Binary notation:	0101 1001.1110 1010.0101 0101.0011 0010

The local subnet mask and the IP address for device 2 are then ANDed bit-by-bit by the software to determine whether device 2 is located in the local subnetwork.

ANDing the subnet mask and IP address for device 2:

Subnet mask		1111 1111.1111 1111.1100 0000.0000 0000
	AND	
IP address:		0101 1001.1110 1010.0101 0101.0011 0010
Result after ANDing		0101 1001.1110 1010.0100 0000.0000 0000

Subnet

After ANDing, the software determines that the relevant subnetwork (01) does not correspond to the local subnetwork (11) and the data telegram is transferred to a subnetwork router.

12 Web-Based Management

The FL IL 24 BK-PAC has a web server, which generates the required pages for web-based management and, depending on the requirements of the user, sends them to the "Factory Manager" or a standard web browser.
Web-based management can be used to access static information (e.g., technical data, MAC address) or dynamic information (e.g., IP address, status information) or to change the configuration (password-protected).

12.1 Calling Web-Based Management (WBM)

The FL IL 24 BK-PAC web server can be addressed using the IP address if configured correspondingly.
The bus terminal homepage is accessed by entering the URL "http://*ip-address*".

Example: http://192.168.2.81

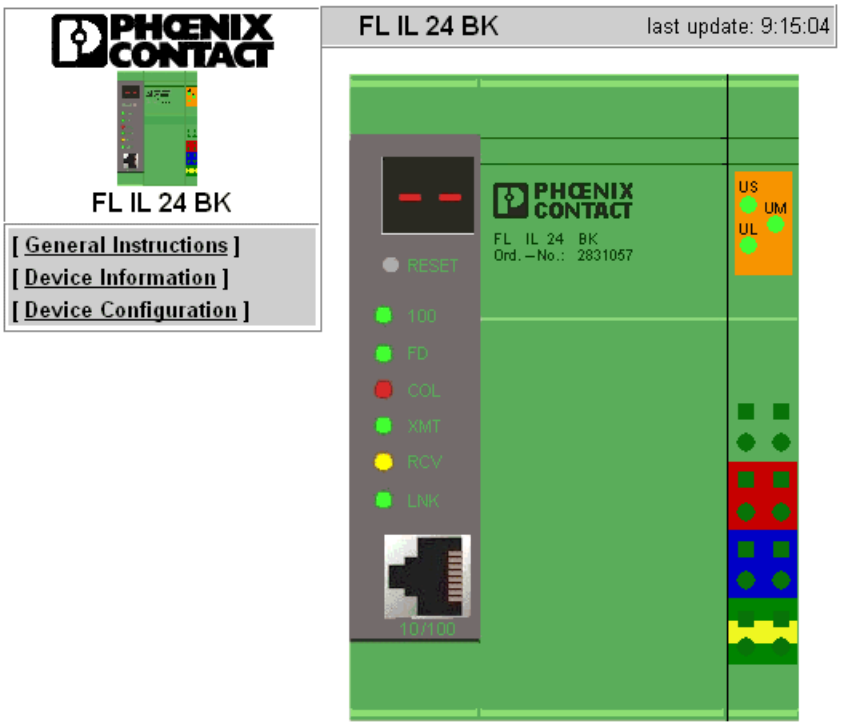
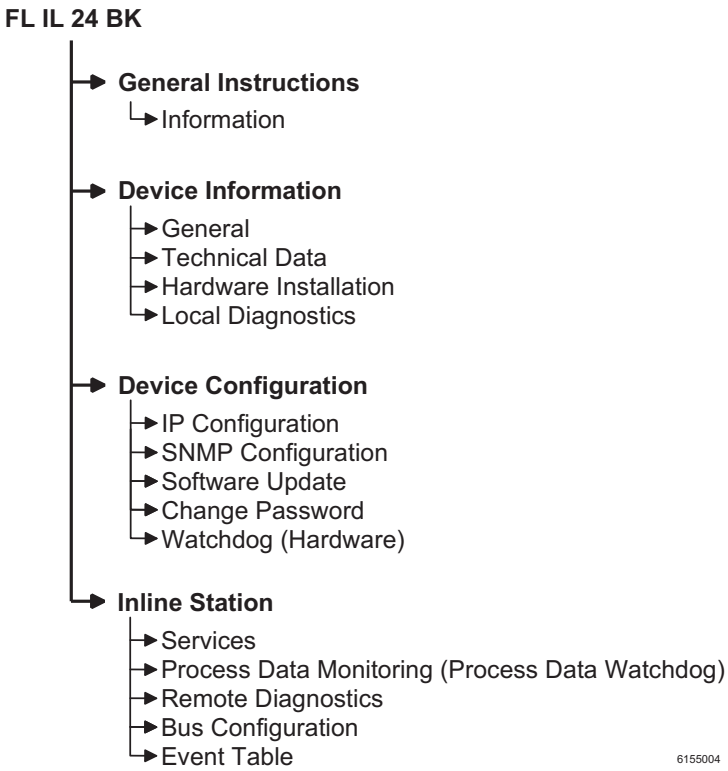


Figure 12 WBM homepage

12.2 Structure of the Web Pages

The Ethernet bus terminal web pages are divided into two, with the selection menu and the relevant submenus on the left-hand side, and the corresponding information displayed on the right-hand side. Static and dynamic information about the bus terminal can be found in the following menus.

12.3 Layout of the Web Pages



12.4 Password Protection

The bus terminal is protected by two passwords (case-sensitive). The password for read access is "public", while the password for read and write access is "private". All status changes to the bus terminal are only possible after the password for read and write access has been entered. The password can be changed at any time. Your unique password must be between four and twelve characters long.

If you forget the password, the device can be re-enabled by Phoenix Contact. Ensure you have the exact device designation, MAC address and serial number ready when you contact the telephone number indicated on the last page.

13 Firmware Update

When activating a firmware update, ensure that a valid firmware version is available. Otherwise the management part of the device attempts to update repeatedly and is unavailable for management and diagnostic functions.

13.1 Firmware Update Using The Factory Manager

The following steps must be carried out when executing a firmware update with the Factory Manager:

1. In Device View, right click on the device whose firmware you want to update. Select "Properties" from the context menu and then the "BootP Parameter" tab.
2. Select the "Reply on BootP requests" check box.

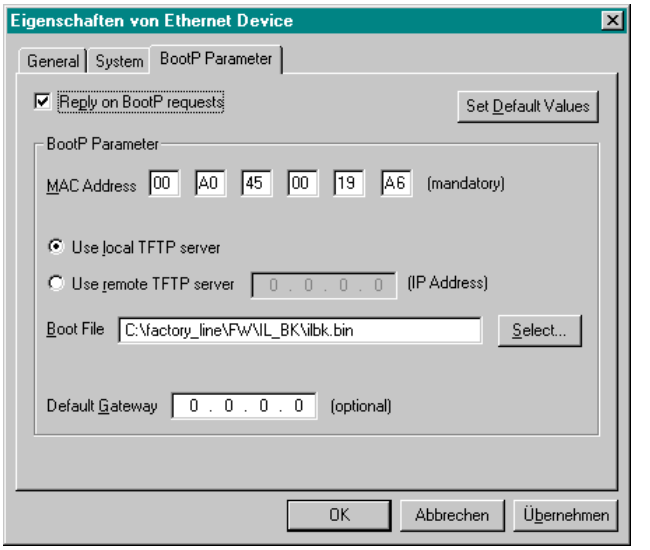
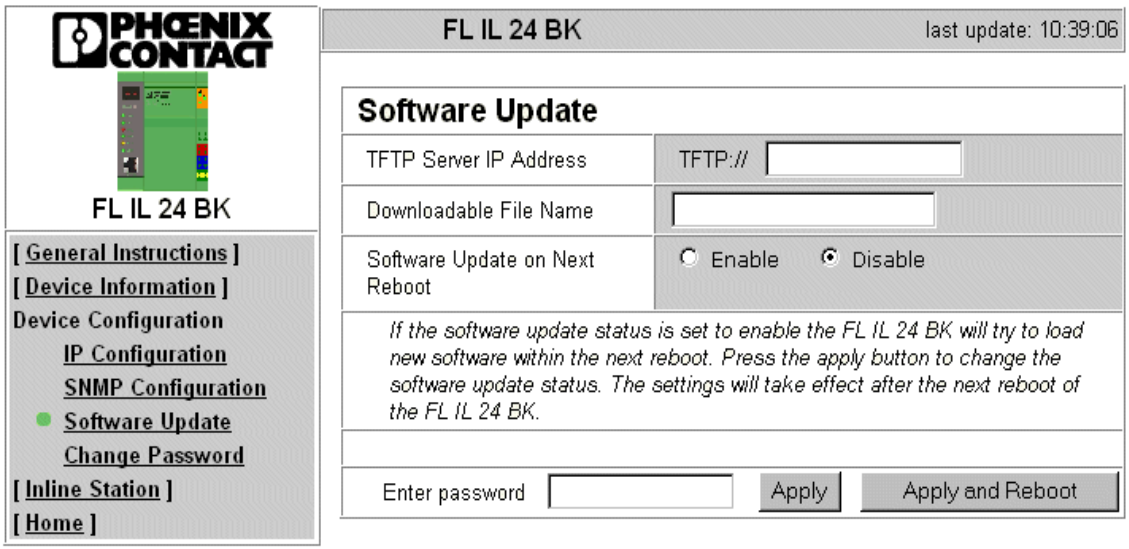


Figure 13 Ethernet Device Properties dialog box in the Factory Manager

3. Local tftp server: Check that a valid firmware version is located in the "*Download*" directory of the Factory Manager. The firmware update **cannot** be executed from another directory. If the default settings have been used for the Factory Manager, the path leads to the following directory: "*C:\Programs\Phoenix Contact\Factory Manager\Download*".
   Remote tftp server: Save the new firmware to the desired tftp server.

4. Local tftp server: Click on "Select" and select the firmware file. Click on "Open". After confirming, the file is in the "Boot File" field.
   Remote tftp server: Click on "Use remote TFTP server" and enter the file name of the firmware and the path name, if necessary, in the "Boot File" field. Click on "OK".
5. Ensure that the BootP and tftp server for the Factory Manager are activated.
6. Click on "OK". Open the web page for the bus terminal (context menu or Ctrl+W). Click on "Device Configuration" and then "Software Update". In the "Software Update on Next Reboot" field, click on "Enable".

On a firmware update using the Factory Manager, the firmware file and tftp path name entry, which is set under the Boot parameters, has priority. Therefore in this case you do not need to change the "TFTP Server IP Address" or the "Downloadable File Name" on the bus terminal web page.



7. Enter your password and click "Apply" to execute a reboot at a later time; click on "Apply and Reboot" for the update to take effect immediately.

The display indicates "03" (requesting firmware download at tftp server), then "04" (downloading firmware to memory) and finally "05" (firmware transfer to memory complete). The bus terminal is then automatically restarted.

13.2 Firmware Update Using Web-Based Management (WBM) Without the Factory Manager

The following steps must be carried out when executing a firmware update with WBM:

1. Open the web page for the bus terminal, by entering the IP address for the bus terminal in the address line of a standard web browser. After the web page has been loaded, click on "Device Configuration" and then "Software Update". Enter the IP address of the tftp server in the "TFTP Server IP Address" field. Then enter the file name of the firmware and the path name, if necessary, in "Downloadable File Name". In the "Software Update on Next Reboot" field, click on "Enable".
2. Enter your password and click "Apply" to execute a reboot at a later time; click on "Apply and Reboot" for the update to take effect immediately.

The display indicates "03" (requesting firmware download at tftp server), then "04" (downloading firmware to memory) and finally "05" (firmware transfer to memory complete). The bus terminal is then automatically restarted.

14 Transfer of I/O Data

The I/O data of individual Inline modules is transferred via memory areas organized in a word-oriented way (separate memory areas for input and output data). The Inline modules use the memory according to their process data width. The assignment of the individual bits is shown in the following diagram:

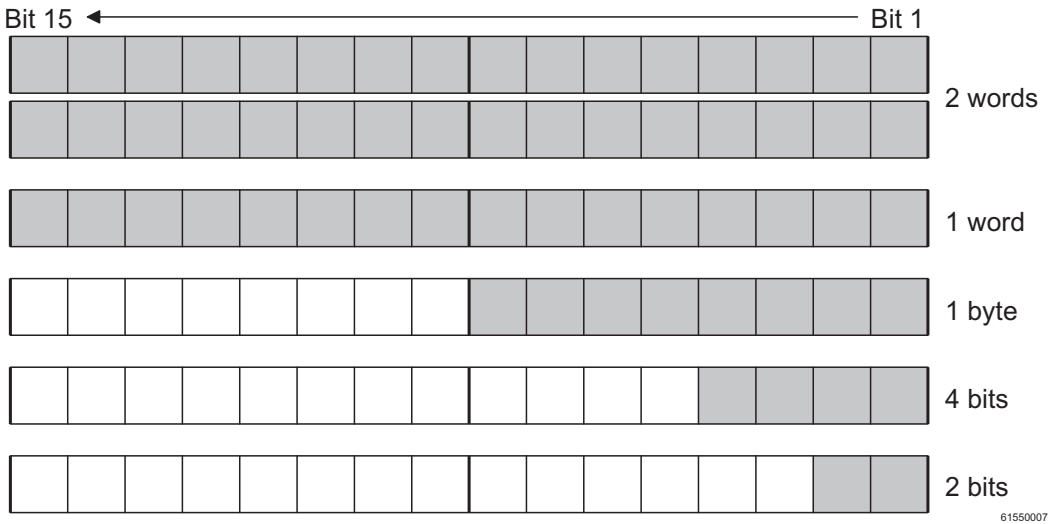


Figure 14 Position of the user data for individual devices in the word array

To achieve cycle consistency between input/output data and the station bus cycle, the bus terminal uses an exchange buffer mechanism. This mechanism ensures that the required input/output data is available at the correct time and is protected during writing/reading by appropriate measures.

The following diagram shows the position of the user data for several devices in the word array.

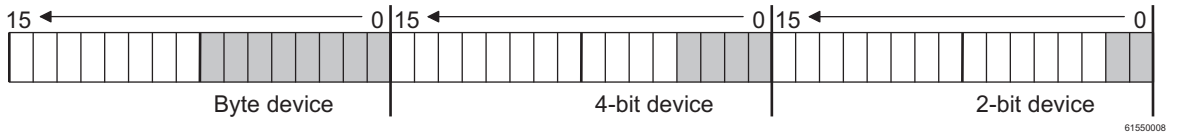


Figure 15 Position of the user data for several devices in the word array

15 Startup Behavior of the Bus Terminal

The startup behavior of the bus coupler is determined by two system parameters: plug & play mode and expert mode. In the delivery state the P&P mode is activated and the expert mode is deactivated.

15.1 Plug &Play Mode

Please note that the following description only applies if the expert mode is deactivated.

P&P mode activated

The FL IL 24 BK-B supports plug & play mode (P&P). This mode enables connected Inline modules to be started up in the field using the Ethernet interface without a higher-level computer. The P&P status (active or inactive) is stored retentively on the bus terminal. In the P&P mode the connected Inline terminals are detected and their function is checked. If the physical configuration is ready for startup, it is stored retentively as reference configuration.
If the connected configuration could be installed as reference configuration the "PP" LED of the bus coupler lights up.
The P&P mode must be deactivated again so that the reference configuration will not be overwritten next time the bus coupler is started. The deactivation of the P&P mode at the same time serves as acknowledgement of the reference configuration and the release of the process data exchange.

Deactivated P&P mode

In the deactivated P&P mode the reference configuration is compared to the physical configuration. If they are identical the bus coupler can be set into the "RUN" state.

If, however, the reference configuration and the physical configuration are not identical, the "FAIL" LED lights up and a process data exchange is not possible due to safety reasons.

There are two possibilities how you can to operate the bus nevertheless:

1. Restore the original configuration so that the reference configuration and the physical configuration are identical again or
2. activate the P&P mode so that the current physical configuration can be accepted as reference configuration.

15.2 Expert Mode

Please observe that the following description applies for the dactivated mode. Possible combinations of both modes and their behavior are described on page 31.

Expert mode deactivated

If the expert mode is deactivated (default upon delivery) the error-free configuration is automatically set to the "RUN" state. If the configuration is defective or is not identical with the reference configuration the "FAIL" LED lights up and a process data exchange is impossible.

Expert mode activated

If the expert mode is active, the error-free configuration is set to the "READY" state but not automatically into the "RUN" state. The user must use correct firmware commands such as ACTIVATE_CONFIGURATION, 0x0711 or START_DATA_TRANSFER, 0x0701, to set the station to the "RUN" state.

15.3 Possible Combinations of the Modes

Possible combinations of the modes and their effects

P&P Mode	Expert Mode	Description / Effect	Diagram
Deactive	Deactive	Under normal circumstances- the station sets valid configurations in the "RUN" state. Process data exchange is possible.	Figure 16 on page 32
Deactive	Active	A valid configuration is set to the "READY" state. Process data exchange is only possible if the station was set to the "RUN" state using firmware commands.	Figure 17 on page 32
Active	Deactive	The connected configuration is stored as reference configuration and the station is set to the "RUN" state. Process data exchange is impossible.	Figure 18 on page 33
Active	Active	A physical configuration is stored as reference configuration and the is set to the "Ready" state. Process data exchange is only possible if the P&P mode is deactivated and the station is set to the "RUN" state using firmware commands.	Figure 19 on page 33

15.4 Startup Diagram of the Bus Coupler

"Standard" Mode / P&P and Expert Mode Deactivated

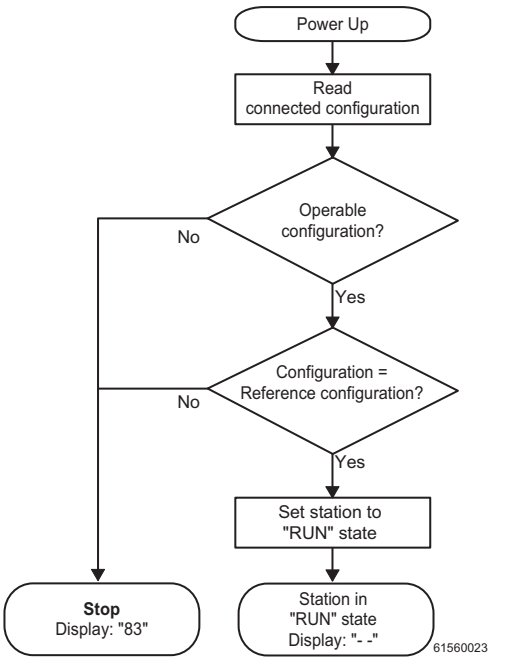


Figure 16 "Standard" mode / expert and P&P mode deactivated

P&P Mode Deactivated - Expert Mode Activated

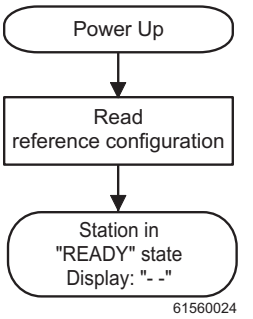


Figure 17 P&P mode deactivated - expert mode activated

P&P Mode Activated - Expert Mode Deactivated

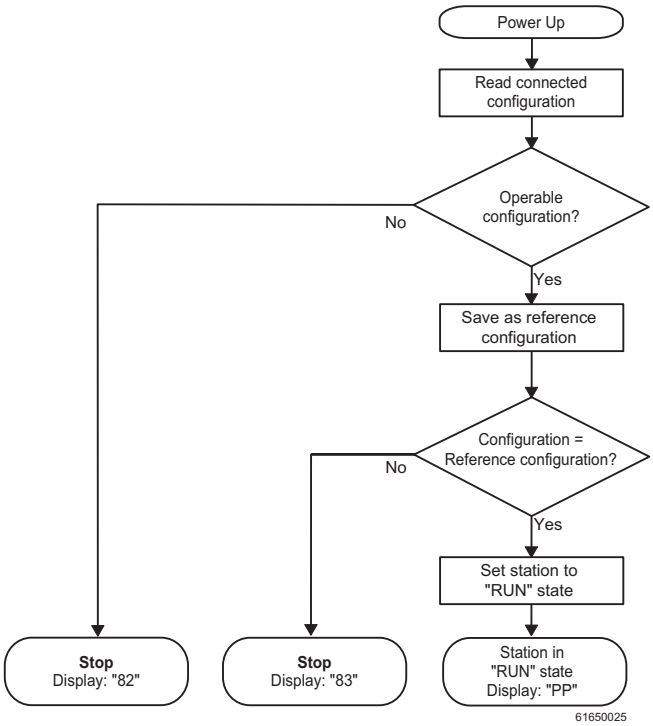


Figure 18 P&P mode activated - expert mode deactivated

P&P Mode and Expert Mode Activated

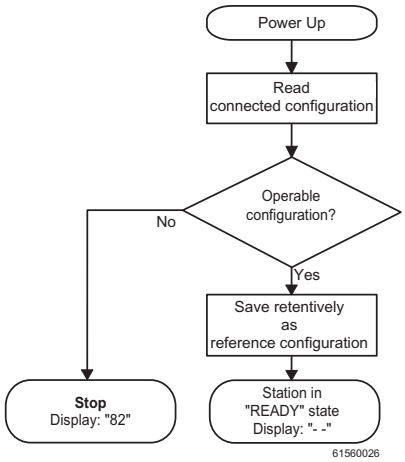


Figure 19 P&P mode and expert mode activated

15.5 Changing and Starting a Configuration in P&P Mode

Ensure that plug & play mode is activated and expert mode is deactivated.

The following steps must be carried out when **changing** an existing configuration as shown in the flow chart:

– Switch the power supply off.
– Change the configuration.
– Switch the power supply on.

A configuration is **started** as shown in the flowchart (see Figure 16 to Figure 19). During startup, please observe the following:

– Once the terminal has been switched on, the previously found configuration is read and started, as long as no errors are present. In addition, the active configuration is saved in the EEPROM as the reference configuration.
– All connected Inline devices are integrated in the active configuration if the "DIAG" LEDs are continuously lit on all modules.
– To prevent the accidental use of the wrong configuration, process data can only be accessed when P&P mode has been deactivated.

When P&P mode is active, access to process data is rejected with the error message $00A9_{hex}$ (ERR_PLUG_PLAY). The outputs of the entire Inline station are reset in P&P mode.
P&P mode is activated using either the I/O browser or the "Set_Value" command via Ethernet. Once P&P mode has been switched off, the bus is only disconnected if the existing configuration and the reference configuration are the same. In addition, the existing configuration will no longer be saved automatically as the reference configuration after a bus terminal restart.

15.6 Changing a Reference Configuration Using the Software

Effects of Expert Mode

Only switch to expert mode if you want to deactivate automatic configuration and activate manual configuration using the firmware commands.

If expert mode (object 2275_{hex}) is activated, automatic startup of the connected local bus is prevented.

The user must manually place the bus in RUN state by activating the configuration (Activate_Configuration/0711_{hex} object or Create_Configuration/0710_{hex} object) and by starting the local bus (Start_Data_Transfer/0701_{hex} object).

In expert mode, the bus terminal behaves in the same way as the gateways (IBS SC/I-T or IBS 24 ETH DSC/I-T).

Changing a Reference Configuration

– Deactivate P&P mode.
– Activate expert mode (for access to all firmware commands).
– Place the bus in "Active" or "Stop" state (e.g., using the "Alarm_Stop" command).
– The reference configuration can be downloaded or deleted.
– The connected bus can be read using the "Create_Configuration" command and saved as the reference configuration, as long as the bus can be operated.
– The bus is started using the "Start_Data_Transfer" command. If access to process data is rejected with an error message, this means that no reference configuration is present.

Tabelle 1 System parameters for the "Set_Value" service

Variable ID	System Parameter	Value/Note
0104_{hex}	Diagnostics Status Register	Read only
0105_{hex}	Diagnostics Parameter Register	Read only
2216_{hex}	Actually PD cycle time	Read only
2240_{hex}	Plug & play mode	0: Plug & play mode inactive 1: Plug & play mode active
2275_{hex}	Expert mode	0: Expert mode inactive 1: Expert mode active

16 Ethernet Communication

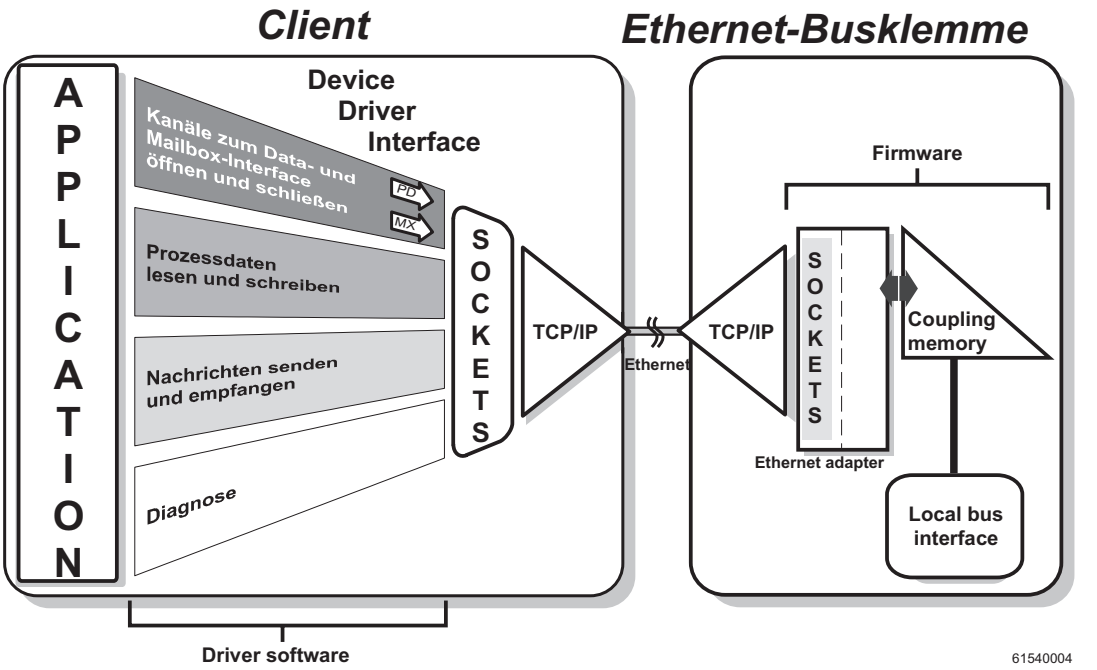


Figure 20 Software structure of the bus terminal

Driver Software on the Workstation

The driver software simplifies the creation of an application program as shown on the left-hand side in Figure 20.
For SUN workstations operated with Solaris, a driver is enclosed in the IBS ETH UM E User Manual (Order No. 27 24 16 4). Since there is a large variety of different operating systems, the driver software is available as source code (IBS ETH DDI SWD E) (Order No. 27 24 19 3). With this documentation you can generate libraries for different Unix systems.
The driver software contains the Device Driver Interface functions. Data can be read and written and messages can be sent and received with these functions. There are also functions for monitoring the controller board and the workstation with the application program. Macro functions are used for the conversion of data between the Intel and the Motorola data format.

Operating System	Driver
Unix (SUN Solaris 2.4)	Library

Inline Bus Terminal Ethernet Communication Functions

The bus terminal provides an easy means of Ethernet communication. It encodes and decodes the data telegrams. It also ensures the network-specific addressing of the controller board in the network, i.e., the management of the IP address.

Behaviour of the outputs when the Ethernet communication is interrupted

In standard operation mode, the FL IL 24 BK retains the last states of the source data in case the Ethernet communication is interrupted (e.g. disconnection of the Ethernet connection).

So that the outputs are reset in the event of an error on the network line (e.g., faulty cable) or at the client (system crash or TCP/IP protocol stack error), one of the monitoring mechanisms
- connection monitoring or data interface (DTI) monitoring
must be activated. If neither monitoring mechanism is activated, the last process data item remains unchanged in the event of an error. See „FL IL 24 BK UM E“ for detailled information.

Host monitoring can be used to determine whether there is still a connection between the bus terminal (host) and the client (user workstation) and whether the client responds to inquiries. With this monitoring it is also possible to detect the following error causes:

– Cable broken or not connected
– Transceiver defective
– Errors or defects in the Ethernet adapter of the bus terminal or in the client
– System crash of the client
– Error in the TCP/IP protocol stack

This status monitoring can be activated for all clients with a DDI connection. A connection to a client, which only uses the Ethernet management cannot be monitored.

17 Supported Firmware Services

Code	Service	Function
0306_{hex}	Initiate_Load_Configuration	Prepares to load a configuration
0307_{hex}	Load_Configuration	Loads the reference configuration
0308_{hex}	Terminate_Load_Configuration	Terminates the loading of a configuration
0309_{hex}	Read_Configuration	Reads the connected and the reference configuration
$030B_{hex}$	Complete_Read_Configuration	Reads the configuration directory
$030C_{hex}$	Delete_Configuration	Deletes the reference configuration
$030E_{hex}$	Control_Parameterization	Controls the parameterization phase
0316_{hex}	Get_Error_Info	Requests additional error information
$032A_{hex}$	Get_Version_Info	Requests additional hardware information
0351_{hex}	Read_Value	Reads the P&P mode status
0701_{hex}	Start_Data_Transfer	Starts data transfer
0710_{hex}	Create_Configuration	Reads the connected configuration and saves it as the reference configuration
0711_{hex}	Activate_Configuration	Tests the configuration frame
0750_{hex}	Set_Value	Changes the P&P mode status
1303_{hex}	Alarm_Stop	Initiates an alarm stop

18 Supported DDI Functions

Service	Function
DDI_DevOpenNode	Establishes connection to the device
DDI_DevCloseNode	Aborts connection to the device
DDI_DTI_ReadData	Reads process data
DDI_DTI_WriteData	Writes process data
DDI_DTI_ReadWriteData	Reads and writes process data in one call
DDI_MXI_SndMessage	Sends a message
DDI_MXI_RcvMessage	Reads a message
GetIBSDiagnostic	Reads the diagnostic bit register and the diagnostic parameter register
ETH_SetHostChecking	Regularly addresses the client
ETH_ClearHostChecking	Deactivates client monitoring
ETH_SetDTITimeoutCtrl	Monitors the DTI data channel
ETH_ClearDTITimeoutCtrl	Deactivates monitoring of the DTI data channel
ETH_SetNetFail	Activates the SysFail signal
ETH_GetNetFailStatus	Requests SysFail status
ETH_ClrNetFailStatus	Resets SysFail status

19 Supported PCP Services

Service	Service Code
Initiate_Request	$008B_{hex}$
Abort_Request	$088D_{hex}$
Get_OD_Request	0088_{hex}
Read_Request	0081_{hex}
Write_Request	0082_{hex}
Information_Report_Request	0885_{hex}
Status_Request	0083_{hex}
Identify_Request	0087_{hex}
PNM7_Initiate_Request	$00A0_{hex}$
PNM7_Abort_Request	$08A1_{hex}$

Service	Service Code
Load_Kbl_Par_Loc_Request	0264_{hex}
Service_Execution_Remote_Request	$00C1_{hex}$
Read_Kbl_Loc_Request	0203_{hex}

20 Modbus Function Codes

Code Nr.	Function Code
fc1	Read Coils
fc2	Read Input Discretes
fc3	Read Multiple Registers
fc4	Read Input Registers
fc5	Write Coil
fc6	Write Single Register
fc7	Read Exception Status
fc15	Write Multiple Coils
fc16	Write Multiple Registers
fc23	Read/Write Registers

21 Trap Generation

When important events occur, e.g., a configuration change, the bus terminal sends a trap to a trap manager defined by the user. This enables the network administrator to react quickly to these events and to ensure network availability. Traps are usually only transmitted once.

21.1 Representation of Traps in the Factory Manager

ID	Date	Time	Source	Text
2000	31.1.2001	08:28:32	Trap-Receiver	-->SNMP-Trap (LinkUp an Slice 1, Port 4) received from Inline-I/O Robot (192.168. 2. 80).
2000	31.1.2001	08:28:32	Trap-Receiver	-->SNMP-Trap (LinkUp an Slice 1, Port 3) received from Inline-I/O Robot (192.168. 2. 80).
2000	31.1.2001	08:28:32	Trap-Receiver	-->SNMP-Trap (LinkUp an Slice 1, Port 1) received from Inline-I/O Robot (192.168. 2. 80).
2000	31.1.2001	08:28:31	Trap-Receiver	-->SNMP-Trap (ColdStart) received from Inline-I/O Robot (192.168. 2. 80).
2000	31.1.2001	08:28:31	Trap-Receiver	-->SNMP-Trap (ColdStart) received from Inline-I/O Robot (192.168. 2. 80).

Figure 21 Trap representation in the Factory Manager using a few example traps

21.2 Traps With the FL IL 24 BK-PAC

The FL IL 24 BK-PAC supports five traps:

– ColdStart - sent twice each time the device is restarted.
– PasswordChange - sent after the password is changed successfully.
– FWHealth - sent after any changes to the firmware operating status.

21.3 Defining the Trap Manager

Traps must be sent to a trap manager to be evaluated. Two appropriate network devices can be defined as trap managers. Open the "SNMP Configuration" dialog box in the "Device Configuration" menu, and enter the IP addresses of the trap managers in the "First/Second Trap Manager IP Address" fields. Enter the password for write access and save with "Apply".

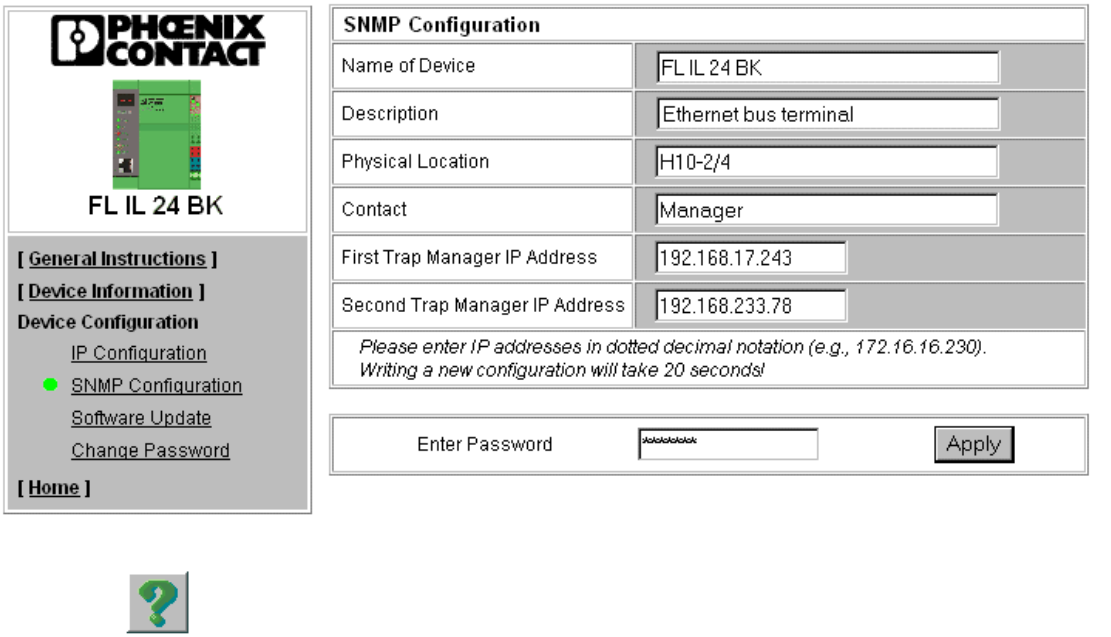


Figure 22 Defining the trap manager

Up to five trap managers can be defined via SNMP.

22 Management Information Base - MIB

The FL IL 24 BK-PAC supports the following MIBs:
Standard MIB:
RFC 1213 (MIB II)
Private MIBs:
PhoenixContact MIB, FL MIB (Factory Line MIB), and FL DEVICE MIB.

22.1 Standard MIBs:

22.1.1 RFC-1213 (MIB II)

System Group (1.3.6.1.2.1.1)

The system group contains information about device management.

(1) interfaces
-- (1) sysDescr
-- (2) sysObjektID
-- (3) sysUpTime
-- (4) sysContact
-- (5) sysName
-- (6) sysLocation
-- (7) sysServices

Interface Group (1.3.6.1.2.1.2)

The interface group contains information about device interfaces.

(2) interfaces
-- (1) ifNumber
-- (2) ifTable
-- (1) if Entry
-- (1) ifIndex
-- (2) ifDescr
-- (3) ifType
-- (4) ifMtu
-- (5) ifSpeed
-- (6) ifPhysAddress
-- (7) ifAdminStatus
-- (8) ifOperStatus

```
-- (9) ifLastChange
-- (10) ifInOctets
-- (11) ifInUcastPkts
-- (12) ifInNUcastPkts
-- (13) ifInDiscards
-- (14) ifInErrors
-- (15) ifInUnknownProtos
-- (16) ifOutOctets
-- (17) ifOutUcastPkts
-- (18) ifOutNUcastPkts
-- (19) ifOutDiscards
-- (20) ifOutErrors
-- (21) ifOutQLen
-- (22) ifSpecific
```

Address Translation Group - AT (1.3.6.1.2.1.3)

The address translation group is mandatory for all systems. It contains information about the address assignment.

```
(3) at
    -- (1) atTable
        -- (1) atEntry
            -- (1) atIfIndex
            -- (2) atPhysAddress
            -- (3) atNetAddress
```

Internet Protocol Group - IP (1.3.6.1.2.1.4)

The Internet protocol group is mandatory for all systems. It contains information concerning IP switching.

```
(4) ip
    -- (1) ipForwarding
    -- (2) ipDefaultTTL
    -- (3) ipInReceives
    -- (4) ipInHdrErrors
    -- (5) ipInAddrErrors
    -- (6) ipForwDatagrams
    -- (7) ipInUnknownProtos
    -- (8) ipInDiscards
    -- (9) ipInDelivers
```

-- (10) ipOutRequests
-- (11) ipOutDiscards
-- (12) ipOutNoRoutes
-- (13) ipReasmTimeout
-- (14) ipReasmReqds
-- (15) ipReasmOKs
-- (16) ipReasmFails
-- (17) ipFragOKs
-- (18) ipFragFails
-- (19) ipFragCreates
-- (20) ipAddrTable
  -- (1) ipAddrEntry
    -- (1) ipAdEntAddr
    -- (2) ipAdEntIfIndex
    -- (3) ipAdEntNetMask
    -- (4) ipAdEntBcastAddr
    -- (5) ipAdEntReasmMaxSize
-- (21) ipRouteTable
  -- (1) ipRouteEntry
    -- (1) ipRouteDest
    -- (2) ipRouteIfIndex
    -- (3) ipRouteMetric1
    -- (4) ipRouteMetric2
    -- (5) ipRouteMetric3
    -- (6) ipRouteMetric4
    -- (7) ipRouteNextHop
    -- (8) ipRouteType
    -- (9) ipRouteProto
    -- (10) ipRouteAge
    -- (11) ipRouteMask
    -- (12) ipRouteMetric5
    -- (13) ipRouteInfo
-- (22) ipNetToMediaTable
  -- (1) ipNetToMediaEntry
    -- (1) ipNetToMediaIfIndex
    -- (2) ipNetToMediaPhysAddress
    -- (3) ipNetToMediaNetAddress
    -- (4) ipNetToMediaType
-- (23) ipRoutingDiscards

ICMP Group (1.3.6.1.2.1.5)

The internet control message protocol group is mandatory for all systems. It contains information about error treatment and control in Internet data traffic.

(5) icmp
-- (1) icmpInMsgs
-- (2) icmpInErrors
-- (3) icmpInDestUnreachs
-- (4) icmpInTimeExcds
-- (5) icmpInParmProbs
-- (6) icmpInSrcQuenchs
-- (7) icmpInRedirects
-- (8) icmpInEchos
-- (9) icmpInEchoReps
-- (10) icmpInTimestamps
-- (11) icmpInTimestampReps
-- (12) icmpInAddrMasks
-- (13) icmpInAddrMaskReps
-- (14) icmpOutMsgs
-- (15) icmpOutErrors
-- (16) icmpOutDestUnreachs
-- (17) icmpOutTimeExcds
-- (18) icmpOutParmProbs
-- (19) icmpOutSrcQuenchs
-- (20) icmpOutRedirects
-- (21) icmpOutEchos
-- (22) icmpOutEchoReps
-- (23) icmpOutTimestamps
-- (24) icmpOutTimestampReps
-- (25) icmpOutAddrMasks
-- (26) icmpOutAddrMaskReps

Transfer Control Protocol Group - TCP (1.3.6.1.2.1.6)

The transfer control protocol group is mandatory for all systems with implemented TCP. Instances for objects, which provide information about a specific TCP connection, apply for as long as the connection is established.

(6) tcp
- -- (1) tcpRtoAlgorithm
- -- (2) tcpRtoMin
- -- (3) tcpRtoMax
- -- (4) tcpMaxConn
- -- (5) tcpActiveOpens
- -- (4) ipRouteMetric2
- -- (6) tcpPassiveOpens
- -- (7) tcpAttemptFails
- -- (8) tcpEstabResets
- -- (9) tcpCurrEstab
- -- (10) tcpInSegs
- -- (11) tcpOutSegs
- -- (12) tcpRetransSegs
- -- (13) tcpConnTable
  - -- (1) tcpConnEntry
    - -- (1) tcpConnState
    - -- (2) tcpConnLocalAddress
    - -- (3) tcpConnLocalPort
    - -- (4) tcpConnRemAddress
    - -- (5) tcpConnRemPort
- -- (14) tcpInErrs
- -- (15) tcpOutRsts

User Datagram Protocol Group - UDP (1.3.6.1.2.1.7)

The user datagram protocol group is mandatory for all systems with implemented UDP.

(7) udp
- -- (1) udpInDatagrams
- -- (2) udpNoPorts
- -- (3) udpInErrors
- -- (4) udpOutDatagrams
- -- (5) udpTable
  - -- (1) udpEntry
    - -- (1) udpLocalAddress
    - -- (2) udpLocalPort

EGP (1.3.6.1.2.1.8)

The EGP group is mandatory for all systems with implemented EGP.

(8) egp
- -- (1) egpInMsgs
- -- (2) egpInErrors
- -- (3) egpOutMsgs
- -- (4) egpOutErrors
- -- (5) egpNeighTable
  - -- (1) egpNeighEntry
    - -- (1) egpNeighState
    - -- (2) egpNeighAddr
    - -- (3) egpNeighAs
    - -- (4) egpNeighInMsgs
    - -- (5) egpNeighInErrs
    - -- (6) egpNeighOutMsgs
    - -- (7) egpNeighOutErrs
    - -- (8) egpNeighInErrMsgs
    - -- (9) egpNeighOutErrMsgs
    - -- (10) egpNeighStateUps
    - -- (11) egpNeighStateDowns
    - -- (12) egpNeighIntervalHello
    - -- (13) egpNeighIntervalPoll
    - -- (14) egpNeighMode
    - -- (15) egpNeighEventTrigger
- -- (6) egpAs

Simple Network Management Protocol Group (1.3.6.1.2.1.11)

The simple network management protocol group is mandatory for all systems. In SNMP devices, which are optimized to support either a single agent or a single management station, some of the listed objects will be described with the value "0".

(11) snmp
-- (1) snmpInPkts
-- (2) snmpOutPkts
-- (3) snmpInBadVersions
-- (4) snmpInBadCommunityNames
-- (5) snmpInBadCommunityUses
-- (6) snmpInASNParseErrs
-- (7) not used
-- (8) snmpInTooBigs
-- (9) snmpInNoSuchNames
-- (10) snmpInBadValues
-- (11) snmpInReadOnlys
-- (12) snmpInGenErrs
-- (13) snmpInTotalReqVars
-- (14) snmpInTotalSetVars
-- (15) snmpInGetRequests
-- (16) snmpInGetNexts
-- (17) snmpInSetRequests
-- (18) snmpInGetResponses
-- (19) snmpInTraps
-- (20) snmpOutTooBigs
-- (21) snmpOutNoSuchNames
-- (22) snmpOutBadValues
-- (23) not used
-- (24) snmpOutGenErrs
-- (25) snmpOutGetRequests
-- (26) snmpOutGetNexts
-- (27) snmpOutSetRequests
-- (28) snmpOutGetResponses
-- (29) snmpOutTraps
-- (30) snmpEnableAuthenTraps

22.2 Private MIBs

22.2.1 Phoenix Contact MIB

The Phoenix Contact MIB contains manufacturer information.

The following groups are described in this private Phoenix Contact MIB (OID = 1.3.6.1.4.1.4346):

pxcModules (OID = 1.3.6.1.4.1.4346.1) and pxcGlobal (OID = 1.3.6.1.4.1.4346.2)

MIB structure:

(1) pxcModules
--(1) pxcRootModule
(2) pxcGlobal
--(1) pxcBasic
-- (1) pxcBasicName
-- (2) pxcBasicDescr
-- (3) pxcBasicURL

pxcBasicName

OID	1.3.6.1.4.1.4346.2.1.1
Syntax	DisplayString
Access	Read
Description	Contains the manufacturer name, Phoenix Contact GmbH & Co.

pxcBasicDescr

OID	1.3.6.1.4.1.4346.2.1.2
Syntax	DisplayString
Access	Read
Description	Contains the manufacturer name and address, Phoenix Contact GmbH & Co. P.O. Box 1341 32819 Blomberg, Germany

pxcBasicURL

OID	1.3.6.1.4.1.4346.2.1.3
Syntax	DisplayString
Access	Read
Description	Contains the URL for the manufacturer, http://www.phoenixcontact.com

22.2.2 FL MIB

The FL MIB contains information about the Factory Line product group.

This private FL MIB (OID = 1.3.6.1.4.1.4346) describes the pxcFactoryLine (OID = 1.3.6.1.4.1.4346.11) group.

MIB structure:

```
(1) pxcModules
    --(2) pxcFLModule
(11) pxcFactoryLine
    --(1) flGlobal
      -- (1) flBasic
        -- (1) flBasicName
        -- (2) flBasicDescr
        -- (3) flBasicURL
        -- (4) flBasicCompCapacity
      -- (2) flComponents
        -- (1) flComponentsTable
          -- (1) flComponentsEntry
            -- (1) flComponentsIndex
            -- (2) flComponentsName
            -- (3) flComponentsDescr
            -- (1) flComponentsURL
            -- (1) flComponentsOrderNumber
```

flBasicName

OID	1.3.6.1.4.1.4346.11.1.1.1
Syntax	DisplayString
Access	Read
Description	Contains the name of the product group, Factory Line

flBasicDescr

OID	1.3.6.1.4.1.4346.11.1.1.2
Syntax	DisplayString
Access	Read
Description	Contains a brief description of the product group, Ethernet installation system

flBasicURL

OID	1.3.6.1.4.1.4346.11.1.1.3
Syntax	DisplayString
Access	Read
Description	Contains a URL for the product group, http://www.factoryline.de

flBasicCompCapacity

OID	1.3.6.1.4.1.4346.11.1.1.4
Syntax	Integer32 (1...1024)
Access	Read
Description	Contains the number of different components that can be used with this device.

flComponentsTable - flComponentsEntry

OID	1.3.6.1.4.1.4346.11.1.2.1.1
Syntax	
Access	
Description	Generates a table with descriptions for components in the "Factory Line" product group, which can be controlled by this management device.
flComponentsIndex	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.1
Syntax	Integer32 (1 ... 1024)
Access	Read
Description	Contains the product index for the component
flComponentsName	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.2
Syntax	DisplayString
Access	Read
Description	Contains the designation of the component
flComponentsDescr	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.3
Syntax	DisplayString
Access	Read
Description	Contains a brief description of the component
flComponentsURL	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.4
Syntax	DisplayString
Access	Read
Description	Contains the URL of a website with additional information www.factoryline.de
flComponentsOrderNumber	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.5
Syntax	DisplayString
Access	Read
Description	Contains the order number of the component

22.3 FL Device MIB

The FL Device MIB contains general information about components belonging to the Factory Line product group.

This private FL Device MIB (OID = 1.3.6.1.4.1.4346) describes part of the pxcFactoryLine (OID = 1.3.6.1.4.1.4346.11) group.

MIB structure:

```
(1) pxcModules
    --(3) flDeviceModule
(11) pxcFactoryLine
    --(11) flWorkDevice
      -- (1) flWorkBasic
         -- (1) flWorkBasicName
         -- (2) flWorkBasicDescr
         -- (3) flWorkBasicUrl
         -- (4) flWorkBasicSerialNumber
         -- (5) flWorkBasicHWRevision
         -- (11) flWorkBasicCompMaxCapacity
         -- (12) flWorkBasicCompCapacity
      -- (2) flWorkComponents
         -- (1) flWorkComponentsTable
            -- (1) flWorkComponentsEntry
               -- (1) flWorkComponentsIndex
               -- (2) flWorkComponentsOID
               -- (3) flWorkComponentsURL
               -- (4) flWorkComponentsDevSign
               -- (5) flWorkComponentsPowerStat
               -- (11) flWorkComponentsStrongReset
      -- (3) flWorkTraps
         -- (0) flWorksTrapsDelemeter
            -- (1) flWorkFWPasswdAccess
            -- (2) flWorkFWHealth
            -- (3) flWorkFWConf
      -- (11) flWorkFirmware
         -- (1) flWorkFWInfo
            -- (1) flWorkFWInfoVersion
            -- (2) flWorkFWInfoState
               -- (3) flWorkFWInfoDate
               -- (4) flWorkFWInfoTime
```

```
                -- (5) flWorkFWInfoCopyright
                -- (6) flWorkFWInfoBootVersion
                -- (7) flWorkFWInfoBootState
                -- (8) flWorkFWInfoBootDate
                -- (9) flWorkFWInfoBootTime
                -- (11) flWorkFWInfoOperStatus
                -- (12) flWorkFWInfoHealthText
            -- (2) flWorkFWCtrl
                -- (1) flWorkFWCtrlBasic
                    -- (1) flWorkFWCtrlReset
                    -- (2) flWorkFWCtrlTrapDestCapacity
                -- (2) flWorkFWCtrlTrapDest
                    -- (1) flWorkFWCtrlTrapDestTable
                        -- (1) flWorkFWCtrlTrapDestEntry
                            -- (1) flWorkFWCtrlTrapDestIndex
                            -- (2) flWorkFWCtrlTrapDestIPAddr
                -- (3) flWorkFWCtrlPasswd
                    -- (1) flWorkFWCtrlPasswdSet
                    -- (2) flWorkFWCtrlPasswdSuccess
                -- (4) flWorkFWCtrlUpdate
                    -- (1) flWorkFWCtrlUpdateEnable
                    -- (2) flWorkFWCtrlTftpIPAddr
                    -- (3) flWorkFWCtrlTftpFile
                -- (5) flWorkFWCtrlConf
                    -- (1) flWorkFWCtrlConfStatus
            -- (11) flWorkFWInfo
                -- (1) flWorkFWParamSaveConfig
        -- (12) flWorkRptr
```

flWorkBasicName

OID	1.3.6.1.4.1.4346.11.11.1.1
Syntax	DisplayString
Access	Read/write
Description	Contains the device name (corresponds to "sysName" from MIB2)

flWorkBasicDescr

OID	1.3.6.1.4.1.4346.11.11.1.2
Syntax	DisplayString
Access	Read/write
Description	Contains a brief description (corresponds to "sysDescr" from MIB2)

flWorkBasicName

OID	1.3.6.1.4.1.4346.11.11.1.3
Syntax	DisplayString
Access	Read
Description	Contains the URL of the device web page for WBM

flWorkBasicSerialNumber

OID	1.3.6.1.4.1.4346.11.11.1.4
Syntax	Octet String (12)
Access	Read
Description	Contains the serial number of the device

flWorkBasicHWRevision

OID	1.3.6.1.4.1.4346.11.11.1.5
Syntax	Octet String (4)
Access	Read
Description	Contains the hardware version of the device

flWorkBasicCompMaxCapacity

OID	1.3.6.1.4.1.4346.11.11.1.11
Syntax	Integer32 (1...1024)
Access	Read
Description	Contains the maximum possible number of devices that can be connected

flWorkBasicCompCapacity

OID	1.3.6.1.4.1.4346.11.11.1.12
Syntax	Integer32 (1...1024)
Access	Read
Description	Contains the actual number of connected devices

flWorkComponentsTable - flWorkComponentsEntry

OID	1.3.6.1.4.1.4346.11.11.2.1.1
Syntax	
Access	
Description	Generates a table with the description of individual components
flWorkComponentsIndex	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.1
Syntax	Integer32 (1 ... 1024)
Access	Read
Description	Contains the index for the component
flWorkComponentsOID	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.2
Syntax	OBJECT IDENTIFIER
Access	Read
Description	Contains the designation of OIDs/complete path entries
flComponentsURL	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.3
Syntax	DisplayString
Access	Read
Description	Contains the URL of the web page for this component with additional information
flWorkComponentsDevSign	
OID	1.3.6.1.4.1.4346.11.11.2.1.1.4
Syntax	INTEGER (0 ... 255)
Access	Read
Description	Contains the index entry for the component

flWorkComponentsPowerStat	
OID	1.3.6.1.4.1.4346.11.11.2.1.1.5
Syntax	INTEGER
Access	Read
Description	Contains status information about the connected supply voltages: - Unknown 1 - No voltage available 2 - Supply voltage 1 OK 3 - Supply voltage 2 OK 4 - Supply voltage 1 and 2 OK 5
flWorkComponentsStrongReset	
OID	1.3.6.1.4.1.4346.11.11.2.1.1.11
Syntax	INTEGER
Access	Read/write
Description	With write access, a reset can be executed with "2". With read access, the value is always "1" - no reset.

flWorkFWInfoVersion

OID	1.3.6.1.4.1.4346.11.11.11.1.1
Syntax	Octet String (4)
Access	Read
Description	Contains the firmware version as a string. Example for version "3.97": 0x33, 0x2e, 0x39, 0x37

flWorkFWInfoState

OID	1.3.6.1.4.1.4346.11.11.11.1.2
Syntax	Octet String (6)
Access	Read
Description	Contains the firmware release as a string. Example for "beta": 0x62, 0x65, 0x64, 0x61

flWorkFWInfoDate

OID	1.3.6.1.4.1.4346.11.11.11.1.3
Syntax	Octet String (6)
Access	Read
Description	Contains the creation date of the firmware version as a string. Example for "21.05.2001": 0x32, 0x31, 0x30, 0x35, 0x30, 0x31

flWorkFWInfoTime

OID	1.3.6.1.4.1.4346.11.11.11.1.4
Syntax	Octet String (6)
Access	Read
Description	Contains the creation time of the firmware version as a string. Example for "14:10:20": 0x31, 0x34, 0x31, 0x30, 0x32, 0x30

flWorkFWInfoCopyright

OID	1.3.6.1.4.1.4346.11.11.11.1.5
Syntax	DisplayString (6)
Access	Read
Description	Contains the owner of the firmware copyright. Copyright by Phoenix Contact GmbH & Co., 2000

flWorkFWInfoBootVersion

OID	1.3.6.1.4.1.4346.11.11.11.1.6
Syntax	Octet String (4)
Access	Read
Description	Contains the version of the Boot Loader as a string. Example for version "2.65": 0x32, 0x2e, 0x36, 0x35

flWorkFWInfoBootState

OID	1.3.6.1.4.1.4346.11.11.11.1.7
Syntax	Octet String (6)
Access	Read
Description	Contains the Boot Loader release as a string. Example for "beta": 0x62, 0x65, 0x64, 0x61

flWorkFWInfoBootDate

OID	1.3.6.1.4.1.4346.11.11.11.1.8
Syntax	Octet String (6)
Access	Read
Description	Contains the creation date of the Boot Loader version as a string. Example for "09.03.2001": 0x32, 0x31, 0x30, 0x35, 0x30, 0x31

flWorkFWInfoBootTime

OID	1.3.6.1.4.1.4346.11.11.11.1.7
Syntax	Octet String (6)
Access	Read
Description	Contains the creation time of the Boot Loader version as a string. Example for "14:10:20": 0x31, 0x34, 0x31, 0x30, 0x32, 0x30

flWorkFWInfoBootStatus

OID	1.3.6.1.4.1.4346.11.11.11.1.11
Syntax	Integer
Access	Read
Description	Contains the operating state of the firmware. - Problem 1 - No error 2

flWorkFWInfoHealthText

OID	1.3.6.1.4.1.4346.11.11.11.1.12
Syntax	DisplayString
Access	Read
Description	Contains additional information/error states for the firmware.

flWorkFWCtrlReset

OID	1.3.6.1.4.1.4346.11.11.11.2.1.1
Syntax	Integer
Access	Read/write
Description	With write access, a reset can be executed with "2". With read access, the value is always "1".

flWorkFWCtrlTrapDestCapacity

OID	1.3.6.1.4.1.4346.11.11.11.2.1.2
Syntax	Integer32 (1 ... 1024)
Access	Read
Description	Contains the number of devices to which the traps are sent.

flWorkFWCtrlTrapDestTable - flWorkFWCtrlTrapDestEntry

OID	1.3.6.1.4.1.4346.11.11.11.2.2.1.1
Syntax	
Access	
Description	Generates a table with the IP addresses of the trap managers
flWorkFWCtrlTrapDestIndex	
OID	1.3.6.1.4.1.4346.11.11.11.2.2.1.1.1
Syntax	Integer32 (1 ... 1024)
Access	Read
Description	Contains the index of the target component, which must receive the traps
flWorkFWCtrlTrapDestIPAddr	
OID	1.3.6.1.4.1.4346.11.1.2.1.1.2
Syntax	IPAddress
Access	Read/write
Description	Contains the IP address of the target component, which must receive the traps

flWorkFWCtrlPasswdSet

OID	1.3.6.1.4.1.4346.11.11.11.2.3.1
Syntax	Octet String (2 ... 24)
Access	Read/write

For safety reasons, the response is always "******" with read access.

Description

A new password can be entered here with a maximum of 12 characters. Example:
- Your new password should be "*factory3*".
- The password must be entered a second time for confirmation.
- Your entry is "*factory3factory3*".
- Your password for write access is now: "*factory3*"

flWorkFWCtrlPasswdSuccess

OID	1.3.6.1.4.1.4346.11.11.11.2.3.2
Syntax	Integer
Access	Read
Description	A messaged is displayed, which informs you whether the last change of password was successful. - Unknown 1 - Failed 2 - Successful 3

flWorkFWCtrlUpdateEnable

OID	1.3.6.1.4.1.4346.11.11.11.2.4.1
Syntax	Integer
Access	Read/write
Description	A firmware update can be executed here on the next manual restart/reset of the device: - Start with existing firmware 1 - Execute firmware update 2

flWorkFWCtrlTftpIPAddr

OID	1.3.6.1.4.1.4346.11.11.11.2.4.2
Syntax	IpAddress
Access	Read/write
Description	Enter the IP address of the tftp server, where the (new) firmware can be found.

flWorkFWCtrlTftpFile

OID	1.3.6.1.4.1.4346.11.11.11.2.4.3
Syntax	Octet String (0 ... 64)
Access	Read/write
Description	Enter the file name of the (new) firmware here.

flWorkFWCtrlConfStatus

OID	1.3.6.1.4.1.4346.11.11.11.2.5.1
Syntax	INTEGER
Access	Read
Description	Contains a status message about the current hardware configuration: - Configuration OK 1 - Configuration faulty 2 - Configuration saved 3

flWorkFWParamSaveConfig

OID	1.3.6.1.4.1.4346.11.11.11.11.1
Syntax	INTEGER
Access	Read/write
Description	The active configuration can be saved in the EEPROM: - Do not save configuration 1 (has no effect) - Save configuration 2 With read access, the value is always "1".

23 Meaning of the 7-Segment Display

During startup/operation:

Display	Meaning
01	Boot Loader is started, BootP requests are sent
bo	Firmware is extracted
02	Firmware is started
--	Operation

Additional info:

Display	Meaning
PP	P&P mode is activated

During firmware update:

Display	Meaning
03	The firmware is downloaded from the tftp server
04	The firmware is downloaded to the memory
05	The firmware transfer to the memory is complete

Boot Loader error messages:

Display	Meaning	Remedy
17	The transfer of the firmware failed during tftp download (display changes from "03" to "17")	- Check the physical connection - Establish a point-to-point connection - Make sure that the file (with the specified file name) exists and is in the correct directory - Check the IP address of the tftp server - Activate the tftp server - Repeat the download
19	The tftp download was completed successfully, but the file is not a valid firmware version for the bus terminal	- Provide a valid firmware version with the previously specified file name (website: www.factoryline.de) - Repeat the download

The points under "Remedy" are recommendations; they do not all have to be carried out for every error.

Firmware error messages:

Display	Meaning	Remedy
80	An error occurred in the firmware	- Restart the device (power up or reset)
81	An error occurred when accessing EEPROM	
82	The current configuration could not be activated	- Use "Get_Error_Info" to check whether any defective modules are present
83	The current configuration could not be activated because the current configuration and the reference configuration are not the same	- Create a configuration, which corresponds to the reference configuration - Activate P&P mode - Store a new configuration (Create_Configuration)
bF	Bus error, the bus was stopped due to an error	- Check the devices (Get_Diag_Info)
nF	Network error	- Check the Ethernet connection

The points under "Remedy" are recommendations; they do not all have to be carried out for every error.

For all other error codes, please contact Phoenix Contact (see final page).

24 Technical Data

General Data	
Function	Ethernet/Inline bus terminal
Housing dimensions (width x height x depth)	90 mm x 72 mm x 116 mm (3.543 in. x 2.835 in. x 4.567 in.)
Permissible operating temperature (EN 60204-1)	0°C to 55°C (32°F to +131°F)
Permissible storage temperature (EN 60204-1)	-25°C to +85°C (-13°F to +185°F)
Degree of protection	IP 20, DIN 40050, IEC 60529
Class of protection	Class 3 VDE 0106; IEC 60536
Humidity (operation) (EN 60204-1)	5% to 90%, no condensation
Humidity (storage) (EN 60204-1)	5% to 95%, no condensation
Air pressure (operation)	80 kPa to 108 kPa, 2000 m (6562 ft.) above sea level
Air pressure (storage)	70 kPa to 108 kPa, 3000 m (9843 ft.) above sea level
Preferred mounting position	Perpendicular to a standard DIN rail
Connection to protective earth ground	The functional earth ground must be connected to the 24 V DC supply/functional earth ground connection. The contacts are directly connected with the voltage jumper and the FE springs on the bottom of the housing. The terminal is grounded when it is snapped onto a grounded DIN rail. Functional earth ground is only used to discharge interference.
Environmental compatibility	Free from substances that would hinder coating with paint or varnish (according to VW specification)
Resistance to solvents	Standard solvents
Weight	270 g, typical

24 V Main Supply/24 V Segment Supply	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; do not route cable through outdoor areas
Voltage continuation	Through potential routing
Special demands on the voltage supply	The U_S/U_M supplies and the U_{BK} bus terminal supply are provided using two electrically isolated power supply units and therefore do not have the same reference potential.
Behavior in the event of voltage fluctuations	Voltages (main and segment supply) that are passed on from the bus terminal to the voltage jumpers follow the supply voltages without delay.
Nominal value	24 V DC
Tolerance	-15%/+20% (according to EN 61131-2)
Ripple	±5%
Permissible range	19.2 V to 30 V
Current carrying capacity	8 A, maximum
Safety devices	
Surge voltage	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal	Parallel diodes against polarity reversal; in the event of an error the high current through the diodes causes the preconnected fuse to blow.

This 24 V area must be fused externally. The power supply unit must be able to supply 4 times the nominal current of the external fuse, to ensure that it trips in the event of an error.

24 V Bus Terminal Supply	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; do not route cable through outdoor areas
Voltage continuation	Through potential routing
Safety devices	
Surge voltage	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 V are short circuited by the input protective diode.
Polarity reversal	Serial diode in the lead path of the power supply unit; in the event of an error only a low current flows. In the event of an error the fuse in the external power supply unit does not trip. Ensure protection of 2 A by fuses through the external power supply unit.

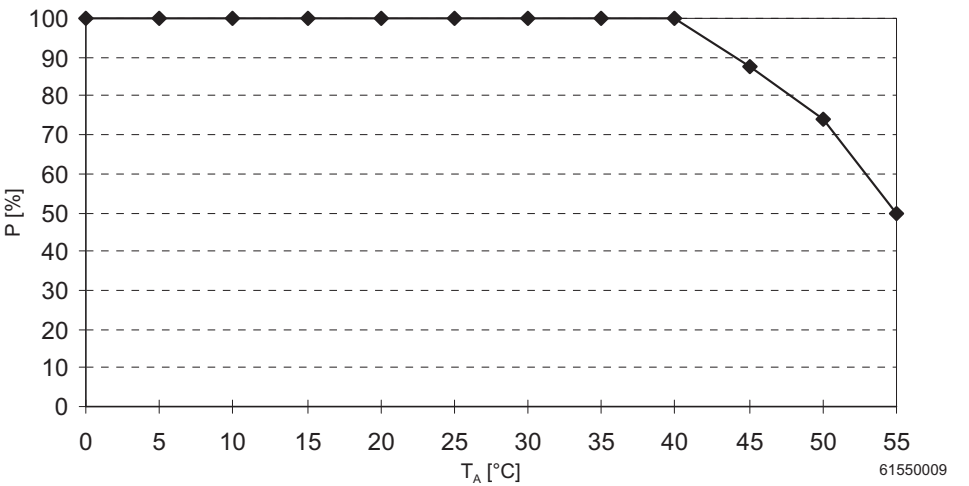
Observe the current consumption of the modules

Observe the logic current consumption of each device when configuring an Inline station. This information example is given in every module-specific data sheet. The current consumption may differ depending on the individual module. The permissible number of devices that can be connected depends on the specific station structure.

Nominal value	24 V DC
Tolerance	-15%/+20% (according to EN 61131-2)
Ripple	±5%
Permissible range	19.2 V to 30 V
Minimum current consumption at nominal voltage	92 mA (At no-load operation, i.e., Ethernet connected, no local bus devices are connected, bus inactive)
Maximum current consumption at nominal voltage	1.5 A (loading the 7.5 V communications power with 2 A, the 24 V analog voltage with 0.5 A)

24 V Module Supply	
- Communications Power (Voltage Jumper)	
Nominal value	7.5 V DC
Tolerance	±5%
Ripple	±1.5%
Maximum output current	2 A DC (observe derating)
Safety devices	Electronic short-circuit protection
- Analog Supply (Voltage Jumper)	
Nominal value	24 V DC
Tolerance	-15%/+20%
Ripple	±5%
Maximum output current	0.5 A DC (observe derating)
Safety devices	Electronic short-circuit protection

Derating of the Communications Power and the Analog Terminal Supply



P [%] Loading capacity of the power supply unit of communications power and analog supply in %

T_A [°C] Ambient temperature in °C

Power Dissipation

Formula to calculate the power loss of the electronics

$P_{tot} = P_{BUS} + P_{PERI}$

$$P_{tot} = 2.6\ W + \left(1.1 \frac{W}{A} \times \sum_{n=0}^{a} I_{Ln}\right) + \left(0.7 \frac{W}{A} \times \sum_{m=0}^{b} I_{Lm}\right)$$

Where

P_{tot}	Total power dissipation of the terminal
P_{BUS}	Power dissipation for the bus operation without I/O load (permanent)
P_{PERI}	Power dissipation with I/O connected
I_{Ln}	Current consumption of the device *n* from the communications power
n	Index of the number of connected devices (n = 1 to a)
a	Number of connected devices (supplied with communications power)
$\sum_{n=0}^{a} I_{Ln}$	Total current consumption of the devices from the 7.5 V communications power (2 A, maximum)
I_{Lm}	Current consumption of the device *m* from the analog supply
n	Index of the number of connected analog devices (m = 1 to b)
b	Index of the number of connected analog devices (supplied with analog voltage)
$\sum_{m=0}^{b} I_{Ln}$	Total current consumption of the devices from the 24 V analog supply (0.5 A, maximum)

Power Dissipation/Derating

Using the maximum currents 2 A (logic current) and 0.5 A (current for analog terminals) in the formula to calculate the power dissipation when the I/O is connected gives the following result:

P_{PERI} = 2.2 W + 0.35 W = 2.55 W

2.55 W corresponds to 100% current carrying capacity of the power supply in the derating curves on page 70.

Make sure that the indicated nominal current carrying capacity in the derating curve is not exceeded when the ambient temperature is above 40°C (104°F). Corresponding with the formula, the total load of the connected I/O is relevant (P_{PERI}). If, for example, no current is drawn from the analog supply, the percentage of current coming from the communications power can be increased.

Example:

Ambient temperature: 55°C (131°F)

1. Nominal current carrying capacity of the communications power and analog supply: 50% corresponding with the diagram

I_{LLogic} = 1 A, $I_{LAnalog}$ = 0.25 A

P_{PERI} = 1.1 W + 0.175 W

P_{PERI} = 1.275 W (equals 50% of 2.55 W)

2. Possible logic current if the analog supply is not loaded:

P_{PERI} = 1.1 W/A x I_{LLogic} + 0 W

P_{PERI}/1.1 W/A = I_{LLogic}

I_{LLogic} = 1.275 W/1.1 W/A

I_{LLogic} = 1.159 A

Safety Devices	
Surge voltage (segment supply/main supply/bus terminal supply)	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal (segment supply/main supply)	Parallel diodes against polarity reversal; in the event of an error the high current through the diodes causes the preconnected fuse to blow.
Polarity reversal (bus terminal supply)	Serial diode in the lead path of the power supply unit; in the event of an error only a low current flows. In the event of an error the fuse in the external power supply unit does not trip. Ensure protection of 2 A by fuses through the external power supply unit.

Bus Interface of the Lower-Level System Bus	
Interface	Inline local bus without PCP communication
Electrical isolation	No
Number of Inline terminals that can be connected	
Limitation through software	63, maximum
Limitation through power supply unit	Maximum logic current consumption of the connected local bus modules: $I_{max} \leq 2$ A DC

Observe the current consumption of the modules

Observe the logic current consumption of each device when configuring an Inline station. This information example is given in every module-specific data sheet. The current consumption may differ depending on the individual module. The permissible number of devices that can be connected depends on the specific station structure.

Interfaces	
Ethernet interface	
Number	One
Connection method	8-pos. RJ45 female connector on the bus terminal
Connection medium	Twisted-pair cable with a cable diameter of 0.14 mm^2 to 0.22 mm^2 (26 AWG to 24 AWG)

Interfaces	
Cable impedance	100 Ω
Transmission rate	10/100 Mbps
Maximum network segment expansion	100 m (328.084 ft.)
Propagation delay	21 BT, maximum
Variability value	2 BT, maximum

Protocols/MIBs	
Supported protocols	TCP/UDP SNMP BootP TFTP HTTP DDI via TCP Modbus/TCP
Supported standard MIB	RFC 1213 (MIB II)
Supported private MIBs	Phoenix Contact MIB FL MIB FL Device MIB

Mechanical Tests	
Shock test according to IEC 60068-2-27	Operation/storage/transport: 25g, 11 ms period, half-sine shock pulse
Vibration resistance according to IEC 60068-2-6	Operation/storage/transport: 5g, 150 Hz, Criterion A
Free fall according to IEC 60068-2-32	1 m (3.281 ft.)

Conformance With EMC Directives	
Developed according to IEC 61000-6.2	
IEC 61000-4-2 (ESD)	Criterion B
IEC 61000-4-3 (radiated-noise immunity)	Criterion A
IEC 61000-4-4 (burst)	Criterion B
IEC 61000-4-5 (surge)	Criterion B

Conformance With EMC Directives	
IEC 61000-4-6 (conducted noise immunity)	Criterion A
EN 55011 (noise emission)	Criterion A

Warning: Portable radiotelephone equipment (P ≥ 2W) must not be operated any closer than 2 m (6.562 ft). There should be no strong radio transmitters or ISM devices in the vicinity.

Ordering Data

Description	Order Designation	Order No.
Ethernet/Inline bus terminal	FL IL 24 BK-PAC	28 31 05 7
Connector, with color print	IB IL SCN-8-CP	27 27 60 8
Labeling field	IB IL FIELD 8	27 27 50 1
End clamp	E/UK	12 01 44 2
Zack marker labeling	ZBFM 6-... (see CLIPLINE)	
Factory Manager, network management software	FL SWT	28 31 04 4
OPC server	IBS OPC SERVER	27 29 12 7
"Configuring and Installing the INTERBUS Inline Product Range" User Manual	IB IL SYS PRO UM E	27 45 55 4
RJ45 connector set **gray** for linear cable (2 pieces)	FL PLUG RJ45 GR/2	27 44 85 6
RJ45 connector set **green** for crossed cable (2 pieces)	FL PLUG RJ45 GN/2	27 44 57 1
Double sheathed Ethernet cable	FL CAT5 HEAVY	27 44 81 4
Flexible Ethernet cable	FL CAT5 FLEX	27 44 83 0
Assembly tool for RJ45 connector	FL CRIMPTOOL	27 44 86 9
Medium converter 660 nm	FL MC 10BASE-T/FO POF	27 44 51 3

Phoenix Contact GmbH & Co. KG
Flachsmarktstr. 8
32825 Blomberg
Germany

+ 49 - (0) 52 35 - 3-00

+ 49 - (0) 52 35 - 3-4 12 00

www.phoenixcontact.com

Worldwide Locations:
www.phoenixcontact.com/salesnetwork